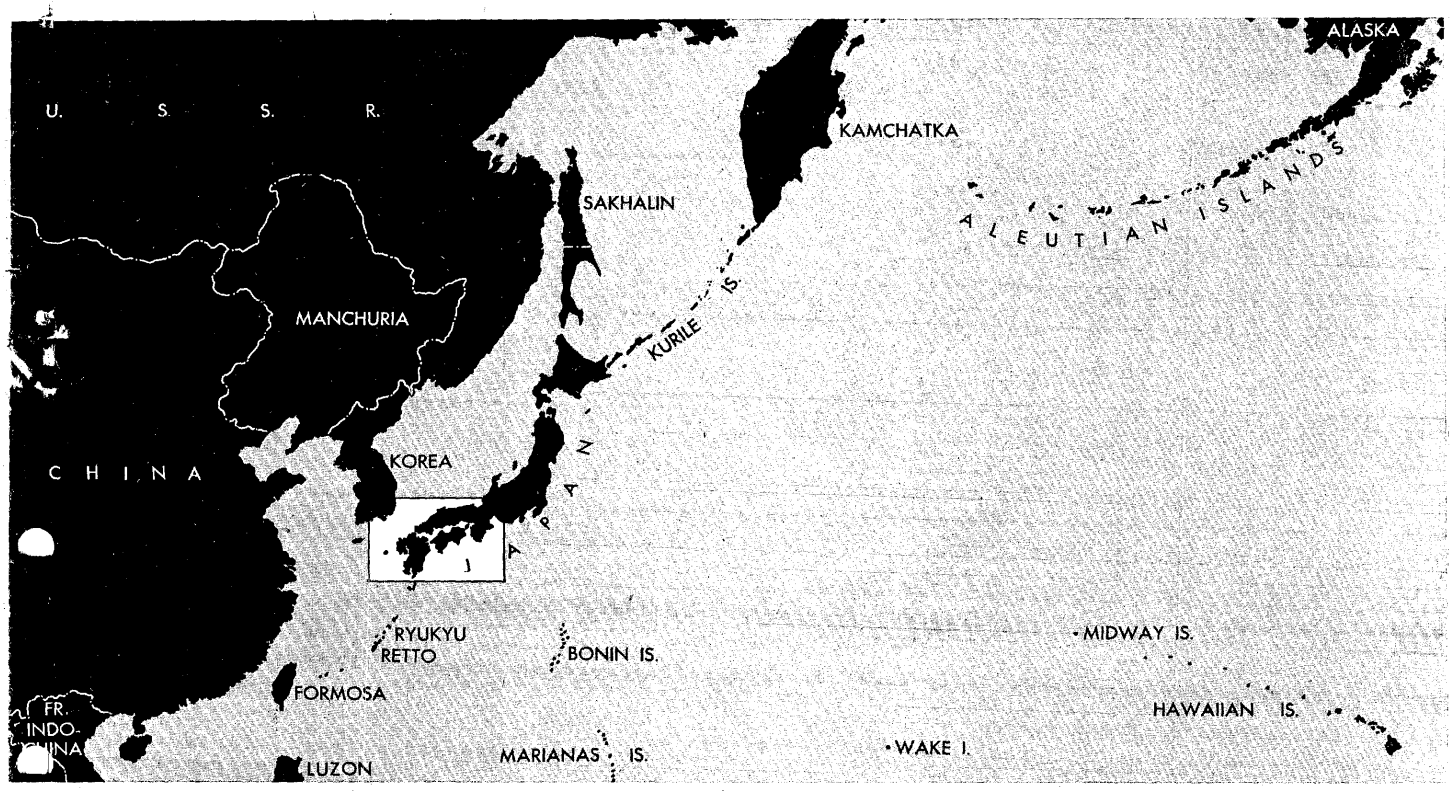
JANIS 84
CHAPTER VI



JOINT ARMY-NAVY INTELLIGENCE STUDY

OF

SOUTHWEST JAPAN:

Kyūshū, Shikoku, and Southwestern Honshū

PORT FACILITIES

AUGUST 1944

25X1

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PORT FACILITIES

60. *Introduction*

Japan has the most important ports in the Pacific Ocean. With the exception of Tōkyō and Yokohama, they are in Southwest Japan, concentrated at either end of the Inland Sea, on the west coast of Kyūshū, and on the northwest coast of Honshū along the Japan Sea. The large number of secondary ports on the Inland Sea—the north coast of Shikoku and the western part of the south coast of Honshū—are intermediate coastal shipping points that feed traffic to the concentrations of principal ports at either end of the sea.

In all, Southwest Japan has 19 principal ports, 41 secondary ports, and 81 other landings. Location of all ports will be found on FIGURE VI - 154, a map attached to an apron at the end of the chapter. The ports are distributed as follows:

Kyūshū—8 principal ports, 11 secondary ports, and 27 other landings.

Shikoku—1 principal port, 13 secondary ports, and 18 other landings.

Southwest Honshū—10 principal ports, 17 secondary ports, and 36 other landings.

The division of ports into the categories of principal, secondary, and other landings is relative; certain ports are artificially equipped, or naturally endowed, with greater advantages than others, and for a specific region are considered principal while others are considered secondary. In addition, there are some points where shipping is carried on, but limited facilities or lack of data result in the classification of these points as other landings.

In general, the principal ports have anchorage, landing, cargo-handling, storage, and clearance facilities capable of accommodating deep-draft, ocean-going vessels; secondary ports have anchorage and facilities for handling coastal traffic. In this study, details of principal and secondary ports are given by textual description and graphic illustration, where available; other landings are listed in tables which give briefly only the significant or controlling factors.

The coastlines of the Japanese islands provide many deep natural harbors. Extensive development of these harbors and the construction of port facilities has been under way since the early 1900's; this development program was intensified in the 1930's and has been in progress to date. Aerial reconnaissance and detailed data on many of the recent improvements were not available in Washington for inclusion in this study.

A large proportion of Japanese ports have artificially improved inner harbors in addition to adjacent natural anchorage areas. Some secondary ports can provide anchorage for whole fleets in the waters off their harbors. Harbor improvements include construction of breakwaters, dredging of channels and water areas, and reclamation of shore land. Concurrent with the construction of landing facilities, the Japanese install adequate mechanical cargo handling, storage, clearance, and repair facilities. Several of the principal and secondary ports are important for shipbuilding and repair as well as anchorage and landing facilities.

Where possible, the Japanese take advantage of rivers flowing into harbors to assist in clearing cargo. At several principal ports, canal networks have been constructed to clear cargo from the harbors to the industrial plants on the banks of the rivers and canals, many of which are quayed for extensive lengths. Rivers and canals are particularly significant at Ōsaka and Nagoya. All the important ports, and virtually all of the secondary ports, are linked to the Japanese highway and railroad systems (FIGURES VII-58 and VII-59, maps showing Japanese railroad and highway systems, Chapter VII).

At the eastern end of the Inland Sea, Kōbe, the largest port in Japan, and Ōsaka and Amagasaki handle the port traffic for the important Kyōtō-Kōbe-Ōsaka triangle, the leading industrial center of Japan.

At the western end of the Inland Sea, Shimonoseki-Moji and Wakamatsu-Yawata-Kokura handle the traffic for important coal, steel, shipbuilding, and other industrial installations.

On the west coast of Kyūshū are the shipbuilding center of Nagasaki, and 6 principal ports—Fukuoka, Karatsu, Sakito, Omuta-Miike, Misumi, and Kagoshima.

On the northwest coast of Honshū along the Japan Sea are 4 principal ports, Tsruga, Miyazu, Sakai, and Hagi, which handle traffic with the Asiatic mainland. Yokkaichi and Nagoya, 2 principal ports, are on the western part of the south coast of Honshū, eastward from Ōsaka and Kōbe. Nagoya is an important aircraft production center.

Kōchi, the only principal port on Shikoku, is on the southern coast of the island.

The secondary southwest Honshū ports, Habu, Onomichi, and Uno are shipbuilding and repair centers. Uno, its adjacent Tama shipyards, and Hibi are often considered parts of Tamano, a city southward from Okayama.

Two closed naval ports, Sasebo on the west coast of Kyūshū and Kure on Honshū, are not discussed in this chapter but are described in Chapter XIII. Maizuru, a secondary Honshū port, used for both naval and commercial purposes, is discussed in both chapters. Kudamatsu, another secondary Honshū port, is a short distance eastward from the Tokuyama Minor Naval Station. Ujina, the port for Hiroshima, and Uno, both southwest Honshū secondary ports, are military embarkation points.

For most ports, the conservative unloading capacity estimates provided by this chapter apply only to the described portions of the facilities, which generally are the deep-draft, relatively well-known quays, wharves, and piers. In some ports where sufficient quantitative data is available in Washington, these estimates come close to approximating the total capacities of the ports. Estimates of unloading capacities made in this chapter, either at ports or individual landing facilities, are based on short tons (2,000 pounds) of general cargo handled at known deep-draft vessel berths, assuming an 8-hour day.

Another set of unloading capacity estimates can be found on FIGURE XII - 15, Chapter XII. These estimates, prepared by the Army Service Forces, are based on the use of all facilities for handling military supplies in terms of short tons (2,000 pounds), assuming a 10-hour day. A tabulation of the unloading

capacity estimates as provided in this chapter and in Chapter XII follows:

NAME	CATEGORY	CHAPTER XII ESTIMATE	CHAPTER VI ESTIMATE
Kyūshū:			
Wakamatsu-Yawata-Kokura	Principal port	11,000 (?)*	No estimate; specialized coal and ore facilities.
Fukuoka	Principal port	4,600	1,000
Karatsu	Principal port	2,000	1,330
Sasebo	Naval port	11,000 (?)	Chapter XIII.
Nagasaki	Principal port	5,000	2,200
Omuta-Miike	Principal port	2,850	1,200
Misumi	Principal port	1,850	960
Kagoshima	Principal port	1,300	No estimate.
Shibushi	Secondary port	650	No estimate.
Aburatsu	Secondary port	650	No estimate.
Hososhima	Secondary port	650	No estimate.
Oita	Secondary port	650	No estimate.
Beppu	Secondary port	650	No estimate.
Makurazaki	Other landing	650	No estimate.
Shikoku:			
Kōchi	Principal port	No estimate	1,000
Komatsushima	Secondary port	2,950 (Listed in Chapter XII as Tokushima)	1,000
Takamatsu	Secondary port	4,600	No estimate.
Sakaide	Secondary port	No estimate	700
Niihama	Secondary port	650	No estimate.
Imabari	Secondary port	1,300	No estimate.
Yawatahama	Secondary port	3,300	No estimate.
Uwajima	Secondary port	3,650	No estimate.
Sukumo	Other landing	350	No estimate.
Nagahama	Other landing	3,950	No estimate.
Marugame	Other landing	350	No estimate.
Honshū			
Tsuruga	Principal port	4,300	3,400
Miyazu	Principal port	No estimate	2,600
Sakai	Principal port	2,300	1,080
Hagi	Principal port	No estimate	400
Shimonoseki-Moji	Principal port	17,850	15,120
Kure	Naval port	3,300 (?)	Chapter XIII.
Kōbe	Principal port	33,000	50,000
Ōsaka	Principal port	50,500	16,250
Yokkaichi	Principal port	2,300	3,500
Nagoya	Principal port	18,500	8,800
Maizuru	Secondary port	**4,950 (?)	600
Ezumi	Secondary port	No estimate	575
Hamada	Secondary port	No estimate	530
Ube	Secondary port	3,300 (?)	No estimate.
Tokuyama	Naval port	4,400 (?)	Chapter XIII.
Hiroshima	Secondary port	5,300	No estimate.
Onomichi	Secondary port	350	No estimate.
Uno	Secondary port	3,300	No estimate.
Toba	Other landing	2,000	No estimate.

* Question mark indicates unloading capacity was based on incomplete information at the time estimate was made.
** May include naval as well as commercial facilities.

The present tense was used in this chapter except where information available in Washington indicated that a facility no longer existed. However, aerial reconnaisance or later information may indicate that a facility so described has been destroyed, removed, changed, or improved. Because they are easily eliminated or changed, references to all mooring buoys and navigational aids have been made in the past tense.

Spellings of place names in the text are in agreement with those used on the Army Map Service's 1 to 250,000 series and with the latest decisions of the Board on Geographic Names. Spellings of place names included on sections of Hydrographic Office charts used as illustrations in this chapter will not always agree with the spellings used in the text, but will be close enough to enable identification. Correct spellings are given in the Gazetteer, Chapter XV. Most of the points discussed in this chapter can be located on the plans included in the Plans Pouch accompanying JANIS 84.

A glossary of the Japanese words, prefixes, and suffixes, and their English equivalents, used frequently in this chapter follows:

JAPANESE	ENGLISH
-bashi (-hashi)	bridge
-bi	cape, head, point
-byōchi	anchorage, port, harbor
chiisa (i)	little, small
dai-(tai-)	large, great, big
-dai	plateau, plain, hill
-dake (take)	mountain, peak, summit
-dani (tani)	valley, stream
-gawa (-kawa)	river
-guntō	island group, archipelago
haku	white
-hakuchi	anchorage, roadstead, port, harbor
-hana	cape, head, point
-hantō	peninsula
-hashi	bridge
-hayashi	wood, forest
higashi	east
hoku	north
-iwa	rock, cliff
-jima (shima)	island
jō	upper
ka-	lower
-ka	river, creek
-kai	sea, bay, gulf
-kaikyō	strait, channel
-kaiwan	gulf, bay
-kaku	cape, head, point
kami-	upper
-kawa (gawa)	river, stream, creek, brook, rivulet
-kei	creek, river, brook, rivulet
kita	north
-kō	creek, brook, rivulet, ditch
-kō	harbor, port, anchorage
kō-	high
-ko	lake, pond, lagoon
ko-	old
-kō	river-mouth
ko	small, little
koku	black
-kuchi	river-mouth
kuro (i)	black
-misaki (-saki, -zaki)	cape, headland, point
minami	south
-mine	mountain peak, mount, summit
-mizu	water
-nada	open bay, gulf, sea
naga (i)	long
nan	south
nishi	west
-numa	swamp, lake, pond, marsh
ō-	great, big, large
o-	little, small
-oki	coast, shore, offing
-rei	peak
-rettō	chain of islands
sai	west
-saki	cape, point, headland
-sammyaku	mountain range
-sawa	swamp, stream, marsh, ravine
-se	shoals, rapids, shallows, reef
sei	west
-seki	rock
-seto	strait, channel

-shima (jima)	island
shimo-	lower, under
shin-	new
shiro-	white
shita-	under, lower
-shō	reef, shoal, sunken rocks, village
-shotō	island, group, archipelago
-sui	water
suidō	sound, channel
taka (i)	high
-take	mountain peak, mountain
tai-(dai-)	large, great, big
-tan	lake, pool
-tani	valley, stream
tō	east
-tō	island
ue-	upper
-umi	sea, bay, gulf
-ura	gulf, creek, bay, inlet, cove
-wan	gulf, bay
-yama	mountain, hill, peak, ridge
-zaki (-saki)	cape, point
-zan (-san)	mountain, hill
-zawa	swamp, stream, marsh, ravine

61. *Kyūshū*

The 8 principal ports on Kyūshū are on the northwestern and western coasts. The most important are Wakamatsu and Nagasaki. The later, one of the 3 major Japanese shipbuilding centers, has a large, well-sheltered harbor that provides extensive, good anchorage; virtually the entire inner harbor is spotted with piers, wharves, quays, shipyards, drydocks, cranes, and other port facilities. However, based on the data available, only 1 commercial and 2 shipyard wharves are described as being able to handle deep-draft, ocean-going vessels. Repair work on some of the largest vessels afloat can be made at the extensive Nagasaki shipyards of the Mitsubitsi and Matsuo interests.

Wakamatsu and adjacent ports form part of the Shimonoseki strait area, one of the major industrial regions of Japan. Wakamatsu itself is a coal port; the important Imperial Steel Works are at nearby Yawata. Also in the Wakamatsu harbor area are Tobata, Kokura, and Akasaka. There are 96,790 feet of faced or quayed landing facilities in the Wakamatsu-Yawata-Kokura harbor area; with the exception of several 29½ feet depths. However, most of the reported depths alongside are under 20 feet.

Shimonoseki, the hub of the industrial region in which Wakamatsu and adjacent ports are located, is on the southwestern tip of Honshū and is described in Topic 63, A, (5), together with Moji, a Kyūshū port on the same harbor.

Other principal ports on Kyūshū are: the coal port of Fukuoka which has extensive anchorage and oil storage facilities, but only 1 quay with depths sufficient to handle deep-draft, ocean-going vessels; Karatsu which has good anchorage but poor depths alongside the landing facilities; the coal port of Sakito; the coal and industrial port of Omuta-Miike which has harbor facilities limited by a drying mud flat extending from 1½ to 2 miles offshore; Misumi which has 1 cargo wharf in 24 to 48 feet of water; and Kagoshima.

Superfortresses of the Twentieth Air Force bombed Yawata for the first time on 15 June 1944, and Nagasaki for the first time on 10 August 1944.

Sasebo, on the west coast of Kyūshū, north of Nagasaki, is a closed naval port and is discussed in Chapter XII, 133, A.

There are 11 secondary ports scattered around the coast of Kyūshū; two of these, Ōita and Beppu, provide the most important facilities on the east coast of the island because they are on Beppu-wan, a bay providing approximately 170 first-class anchorage berths. However, both ports have relatively minor harbors and landing facilities.

Twenty seven other landings also are located around the coasts of Kyūshū and off-lying islands.

Principal and secondary ports and other landings are discussed in this topic in order of their geographical location, moving counterclockwise around the island: principal ports start with Wakamatsu and adjacent ports on the northern tip of the island; secondary ports start with Shibushi on the southeastern coast; and other landings start with Uchiumi on the southeastern coast.

A. Principal ports.

(1) Wakamatsu-Yawata-Kokura (33° 54′ N, 130° 49′ E).

Wakamatsu and the adjacent port towns of Tobata, Yawata, Kokura, and Akahaka are on the northern tip of Kyūshū on the strip of water separating this island from the southwestern tip of Honshū. Shimonoseki-kaikyō, the strait which provides entrance to Wakamatsu and Kokura harbors, also leads into Kammon-kō, the harbor for Shimonoseki and Moji. The strait also provides an entrance into Japan's Inland Sea (Seto-Naikai). Shimonoseki, on the southwestern tip of Honshū, and Moji, across the strait on Kyūshū, are described as a single port in Topic 63, A, (5), principal ports of Southwest Honshū. Wakamatsu, Shimonoseki, and environs constitute one of the major industrial regions of Japan. A network of railways, roads, and ferries connects the major points in this region and tie into main island systems.

Wakamatsu, essentially a coal port, is on the northwestern side of the harbor; Yawata, site of the large Imperial Steel Works, is on the southeastern side of the harbor; and Tobata, a fishing port, is across the main harbor from Wakamatsu. Kokura is eastward from Wakamatsu and Tobata; Akasaka is 1¼ miles east-northeastward from Kokura (FIGURE VIII - 111)*.

Anchorage in the outer harbor is limited to third-class berths. There are 96,790 feet of faced or quayed landing facilities in the Wakamatsu-Kokura area, but with few exceptions the reported depths alongside are under 20 feet. The best depths alongside, 29½ feet, are found in one of the 2 basins at Kokura. The main and inner Wakamatsu harbors had mooring buoys in 19 to 29 feet of water. The harbor facilities are designed primarily to handle bulk coal and ore.

(a) Harbor. Wakamatsu-ko, an artificial harbor, is composed of an outer harbor, main harbor, and inner harbor. Kokura-ko, 3 miles eastward of Wakamatsu, is an artificial harbor, on both sides of the mouth of the Murasaki-kawa (river). Akasaka is also an artificial harbor (FIGURES VI - 1 and VI - 2).

1. OUTER HARBOR. Wakamatsu outer harbor is the area eastward of the breakwater at Wakamatsu to Kokura. Depths vary from 1 to 5 fathoms. The breakwater in the outer harbor forming the western side of the entrance channel to Wakamatsu, projects 1.3 miles northward and thence about 1.8 miles north-northeastward. A groin, about 1.1 miles long, which

*Town plan of Wakamatsu and adjacent regions, Chapter VIII.

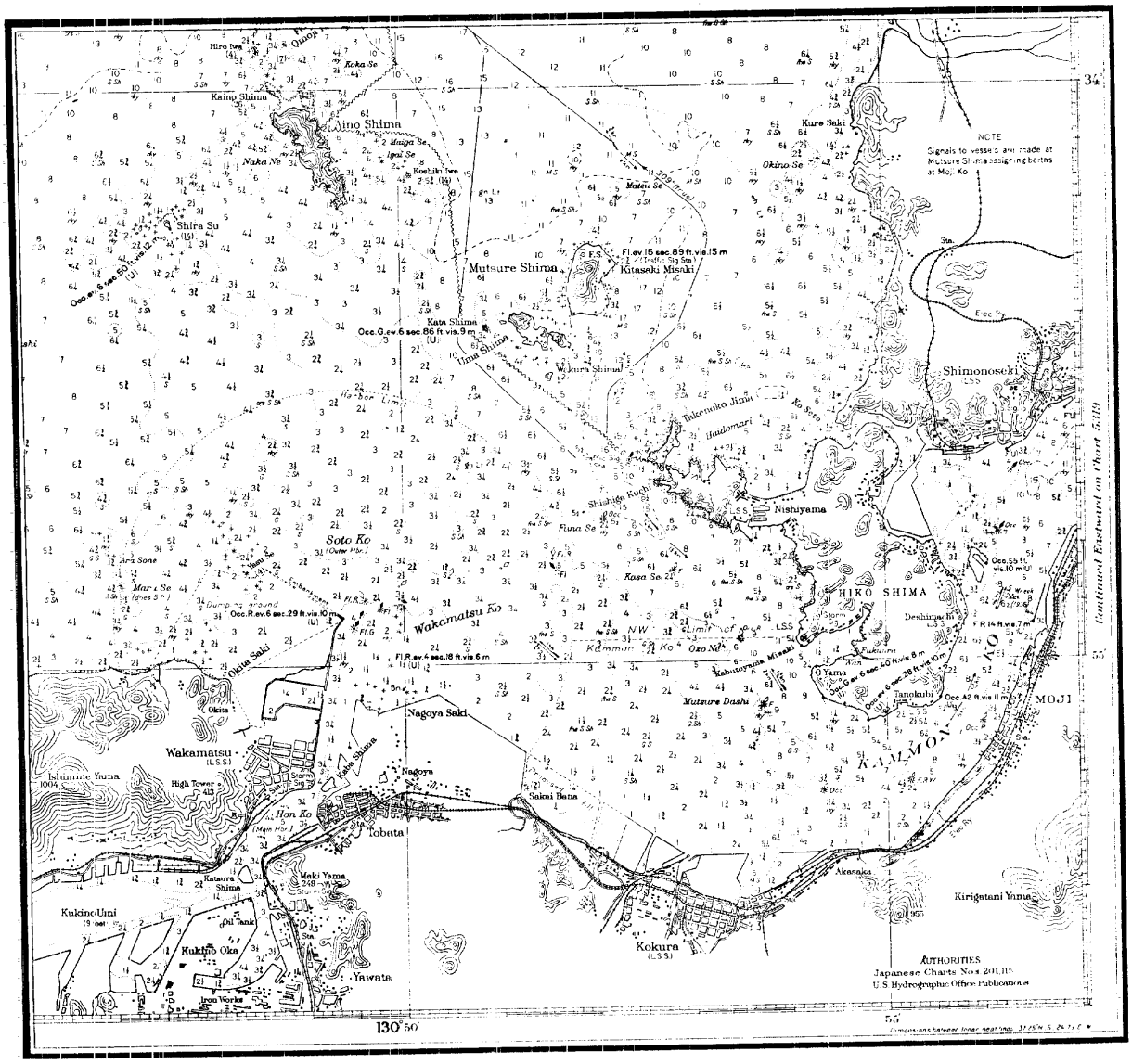

FIGURE VI - 1. *Wakamatsu-Yawata-Kokura.*
Chart of vicinity showing harbors at Wakamatsu and Kokura and location of cities and towns on harbors. Extension of breakwater and other later improvements shown on FIGURE VI - 2.

partly uncovers during low water, extends in a west-northwesterly direction from about the middle of the breakwater. The area westward of the breakwater is used as a dumping ground for slag by the steel works at Yawata. An L-shaped 95-acre tidal basin in the outer harbor, adjoining the Wakamatsu breakwater to the westward, is about 1,025 yards long and 390 yards wide, with charted depths of 2 to 17 feet. It is entered through a 155-yard gap in the breakwater; depth in the gap is about 15 feet.

The waterfront northeastward of Tobata from Nagoya-saki (point) to Kokura has been reclaimed. The water area, about 1.4 miles long and ½ mile wide, immediately westward of Kokura was being dredged to 16 feet in 1935.

2. MAIN HARBOR. Wakamatsu main harbor, between the small islands, Kaba-shima and Kazura-shima, is about 2,000 yards long, with a maximum width of about 875 yards and a minimum of 325 yards. This 196-acre area has charted depths from 17 to 25 feet.

3. INNER HARBOR. The inner harbor comprises Dokai (Kukino-umi), an extensive inlet lying west-southwestward of the main harbor, and the important basin southward of the main harbor, fronting the steel works. The 2,515-acre inner harbor water area is 4.4 miles long and varies in width from about 775 to 1,500 yards. It has shallow depths in the middle, which dry during low water; a dredged channel on the northern side about 100 yards wide and 3 to 16 feet deep; and a similar channel on the southern side with depths of 10½ to 15½ feet. Dredging and land reclamation are reported to be in progress; extensive reclamation was proposed for the extreme western end of the inner harbor. One basin and 11 slips of various sizes and shapes are along the northern side. Some of the longer and narrow slips may be the mouths of streams discharging into the inner harbor. Of the 4 larger ones, the 3 eastern have charted depths of 7 feet, and the western one 6 feet.

Three basins are located on the southern side. The western basin dries during low water. The central basin has a large island at its entrance. The eastern side of this basin has charted depths of 9 to 21 feet, while the greater part of the western side dries during low water.

The eastern basin, used by the steel works at Yawata, is semicircular, has a length of approximately 1.4 miles, and varies in width from about 250 yards in the northern part, a maximum of 535 yards in the middle, and about 200 yards in the western end. Charted depths range from 18 to 33 feet, with 28 feet being the most prevalent. The southwestern tip of the basin has depths as shoal as 11½ feet. An L-shaped basin is on the southeastern side of the main basin. The triangular southeastern leg of the smaller basin is about 240 yards long and from 195 to 35 yards wide, and has charted depths of 9¼ to 11½ feet; the rectangular southwestern leg is about 260 yards long and 55 yards wide, with charted depths of 7 to 9 feet. The entrance to this smaller basin is about 50 yards wide with charted depths of 10½ feet. Another small basin, off the northeastern side of the main basin, is about 130 yards long and 80 yards wide, with charted depths of 7½ to 9½ feet. Its entrance is about 55 yards wide and 9¼ to 11 feet deep.

4. KOKURA HARBOR. Kokura-ko consists of a basin at the mouth of the Murasaki-kawa (river), and a larger basin at the northeastern side of the city at the mouth of Sunatsu-gawa (river). It is not a safe port for lightering. The Murasaki-kawa basin consists of 2 smaller basins: the larger one on the right bank, protected by a breakwater extending about 240 yards west and west-southwestward, is about 230 yards long, 150 yards wide, and was dredged to 9 feet in 1935; the smaller one on the left bank, protected by a breakwater about 70 yards long, is about 325 yards long and 70 yards wide, but has only 1½ feet of water charted at its entrance. The Sunatsu-gawa basin, about 600 yards long and 400 yards wide, has been dredged to 29½ feet. Construction on the outer part of the quay on the eastern side of this basin has been stopped because it increased the waves in the basin.

5. AKASAKA HARBOR. The harbor at Akasaka consists of a basin, about 575 yards long and 55 yards wide with charted depths of 4½ to 9 feet. The entrance to this basin is open to the northeast and is about 50 yards wide. A relatively small tract northeastward of the town, about 230 yards long and 85 yards wide, has been reclaimed. A water area adjoining this tract to the eastward, about 90 yards wide and 480 yards long was being dredged in 1935.

6. ENTRANCE CHANNEL. The entrance to Wakamatsu from the eastward, between Kasa-se (reef) and Funa-se (reef), has a controlling depth of 3¼ fathoms. This channel was being dredged in 1940. About 300 yards north-northeastward of the angle in the breakwater, the channel leads along the eastern side of the breakwater; it has a controlling depth of 19½ feet and is about 200 yards wide. At least 27 feet of water was reported in 1938.

Wakamatsu, a bar harbor, is sometimes dangerous to enter because of the rough seas that are encountered during northerly and westerly winds. The entrance is exposed and quite a sea may build up on the shoal water. Vessels of light draft, when leaving, may get into difficulty in making the turn northward of the angle point in the breakwater if there is much of a breeze. The channel leading into and past Wakamatsu to the eastern basin of the inner harbor at Yawata is very narrow and dangerous.

The entrance channel to both basins at Kokura are clear and free of dangers. The channel to the Murasaki-kawa (river) basin has a controlling depth of 9 feet. The channel to the northeastern basin also has a charted controlling depth of 9 feet, but may have been dredged in 1935.

The entrance channel to Wakamatsu between Uma-shima (island) and Takenoko-shima (island) is reliably reported to be closed to all traffic.

7. ANCHORAGE. The outer harbor affords sufficient room for about 230 third-class anchorage berths over a generally sand and shell bottom.

8. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water lunitidal interval at Wakamatsu is 9 hours, 56 minutes. The high water of springs is 4½ feet above lowest low water, neaps 3¼ feet, and the mean tide level 2½ feet.

The ebb current sets out of Wakamatsu inner harbor, along the breakwater, and curves in the direction of the Shimonoseki-kaikyo. It attains its greatest strength in the vicinity of Kaba-shima, at the head of the main harbor, where the velocity is frequently 2½ knots; in the main and outer harbors the velocity appears to be about 1 knot. The set of the flood current is exactly opposite to that of the ebb, and the velocity is somewhat weaker; the velocity in the outer harbor is ¾ knot. In the vicinity of the angle in the Wakamatsu breakwater, a flood current setting west-northwestward with a velocity of ¾ knot is sometimes experienced, and the ebb setting southwestward at the same rate. Extension of the breakwater may have affected this current.

9. LOCAL WEATHER. During the summer, winds are largely from between east and south and the seas are moderate. In the winter, the predominating winds are from between west and north and are occasionally accompanied by heavy swells. However, these swells are not experienced in Wakamatsu main and inner harbors.

(*b*) *Landing facilities.* Practically all the waterfront in the harbor areas has been improved (FIGURE VI - 2). Quays front the greater part of the main harbor and the Yawata steel works area. Information regarding these improvements is meager. The quays on the southeastern side of the main harbor are used for handling coal. General cargo and coal are handled at those on the northwestern side.

Four piers were reported to be under construction in 1941 in front of the reclaimed land in the outer harbor, between Nagoya-saki and Kokura.

There were 23 mooring buoys in Wakamatsu main harbor, in depths ranging from 19¾ to 21½ feet; 10 in the eastern basin of the inner harbor, in depths ranging from 21½ to 29½ feet; and 3 in the southern part of the central basin on the inner harbor. Tugs are available for berthing vessels at the steel works' quays.

Improvements believed to be faced or quayed, with lengths and depths alongside, are listed in TABLE VI - 1.

TABLE VI - 1

PIERS, WHARVES, AND QUAYS AT WAKAMATSU-YAWATA-KOKURA

Reference on Figure VI - 2	Length (ft.)	Depth (ft.)	Remarks
	Akasaka		
①	200	—	Being dredged (1935)
②	660	6	—
③	380	—	—
④	2,025	4½ to 9	—
Total	3,265		
	Kokura-Sunatsu-gawa basin		
⑤	960 + 295 + 750	29½	Mooring bits every 120'; warehouse served by private railroad on eastern side.
⑥	450 + 1,500	29½	Mooring bits every 120'. customhouse and bonded space of 1.3 acres on middle western side.
Total	3,965		
	Kokura-Murasaki-kawa basin		
⑦	2,700	8	—
⑧	650 + 820	9	—
⑨	525	less than 9	—
⑩	105 + 325 + 1,050	less than 9	—
Total	6,175		
	Wakamatsu outer harbor		
⑪	2,700 + 500 + 2,700	16	Under construction (1941); 4½ to 6' charted on inner 150'.
⑫	640	4½ to 6	16' charted 150' offshore
⑬	2,700 + 500 + 2,700	16	Under construction (1941); 7½' charted on inner 150'.
⑭	640	7½	16' charted 150' offshore
⑮	2,700 + 500 + 2,700	16	Under construction (1941); 9' charted on inner 150'.
⑯	640	9	16' charted 150' offshore
⑰	2,700 + 500 + 2,700	16	Under construction (1941); 9' charted 150' offshore.
⑱	2,650 + 565	3 to 10¼	—
⑲	1,670 + 700 + 175	¼ to 13¾	—
⑳	565 + 1,975	1 to 10¾	—
Total	34,120		
	Wakamatsu main harbor		
㉑	670 + 410 + 345	4¼ to 10½	—
㉒	55 + 900	4¼ to 16	Served by railroad
㉓	550 + 885 + 430 + 1,000	6 to 11	One 35-ton hoist and one 27-ton crane on quay; loading capacity 4,300 tons of coal each per day; served by railroad.
㉔	790 + 65 + 175	15 to 23	3 hydraulic coal loading hoists on quay; total capacity 6,700 tons per day; served by railroad (FIGURE VI - 3).
㉕	6 piers each about 50' long located along this waterfront	16½ at heads	Coal storage yard along entire waterfront; served by railroad.
㉖	615	20½	Served by railroad; probably the Tobata fishing wharf (FIGURE VI - 4).
Total	6,890		
	Wakamatsu inner harbor		
㉗	2,236 + 1,345 + 615 + 105	7¼ to 11¾	Eastern 2,236' is coal loading pier, 19' high and 40' wide, equipped with 17 coal loading bridge cranes; capacity 18,000 tons per day; served by railroad; western part used as coal storage yard (FIGURE VI - 5).
㉘	650 + 415 + 565 + 100	7¼	Coal storage yard
㉙	50 + 625 + 475 + 525	4¼ to 7¼	Coal storage yard
㉚	130 + 555 + 490 + 500	6 to 7¼	Coal storage yard
㉛	65 + 530 + 500	6	Coal storage yard
㉜	1,050 + 200	6½	—
㉝	2,090 + 1,655 + 715	6½	Coal storage yard
㉞	785 + 925	6½	—
㉟	2,165	11¾	1 to 3 feet charted 75' off face of quay
㊱	415	6½ to 9	—
㊲	875 + 460 + 660	4½ to 11¾	—
㊳	415 + 475	4½ to 6½	—
㊴	130 + 140	6½ to 10½	—
㊵	860 + 115 + 230 + 2,760 + 1,680	5¼ to 32¾	—
㊶	1,325 + 3,350	6 to 23¼	One 25-ton, two 2-ton, two 1½-ton cranes, and six 5-ton stationary unloading cranes on quay (FIGURE VI - 6); 9 traveling loading cranes may be located on the NE corner (FIGURE VI - 7).
㊷	570 + 725 + 165 + 890 + 825	7 to 10½	—
㊸	370 + 480	10¼ & 20¾ to 22¾	—
㊹	1,280 + 800	11½ to 24	—
㊺	435 + 230 + 300	7½ to 9½	—
㊻	525 + 190 + 300 + 300	5½ to 16	—
Total	42,324		

Summary

Location	Total length (feet)
Akasaka	3,265
Kokura	10,140
Wakamatsu outer harbor	34,120
Wakamatsu main harbor	6,890
Wakamatsu inner harbor	42,324
Grand total	96,739

(*c*) *Storage facilities.* In addition to the cement warehouse and customhouse at Kokura, the quays at Wakamatsu are provided with sheds and warehouses. In 1930 there was a total of 227.9 acres of coal storage area at Wakamatsu on the southeastern side of Kaba-shima (island), southeastern side of the main harbor (Reference ㉕)*, northern and western side of Kazura-shima (island), and the northern side of the inner harbor (References ㉗, ㉘, ㉙, ㉚, ㉛, and ㉝).

(*d*) *Capacity and clearance.* This is a specialized port with facilities designed primarily for handling bulk coal and ore, and it is impractical to estimate the unloading capacity for general cargo discharged at vessel berths. Wakamatsu is the chief coal exporting point of Japan.

*References are encircled numbers on Figure VI - 2.

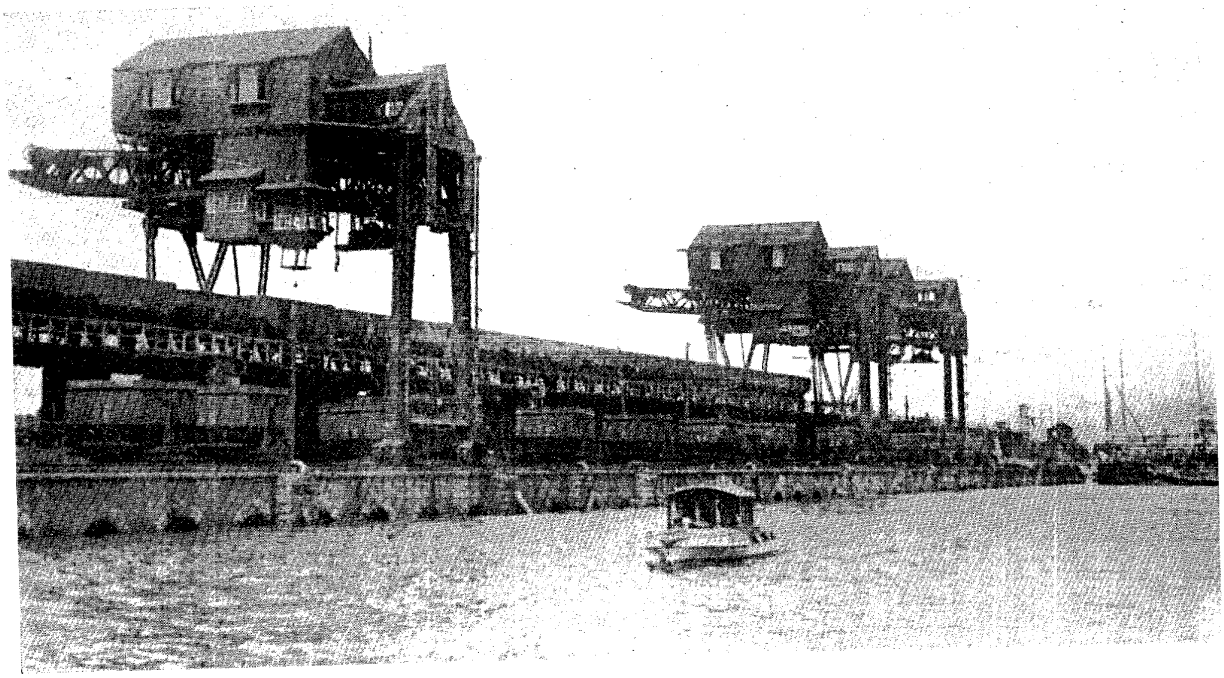

FIGURE VI - 3. *Wakamatsu-Yawata-Kokura.*
Coal loading quay on SE side of main harbor (Reference ㉔), showing 3 traveling hydraulic coal-loading hoists having a total capacity of 6,700 tons per day.

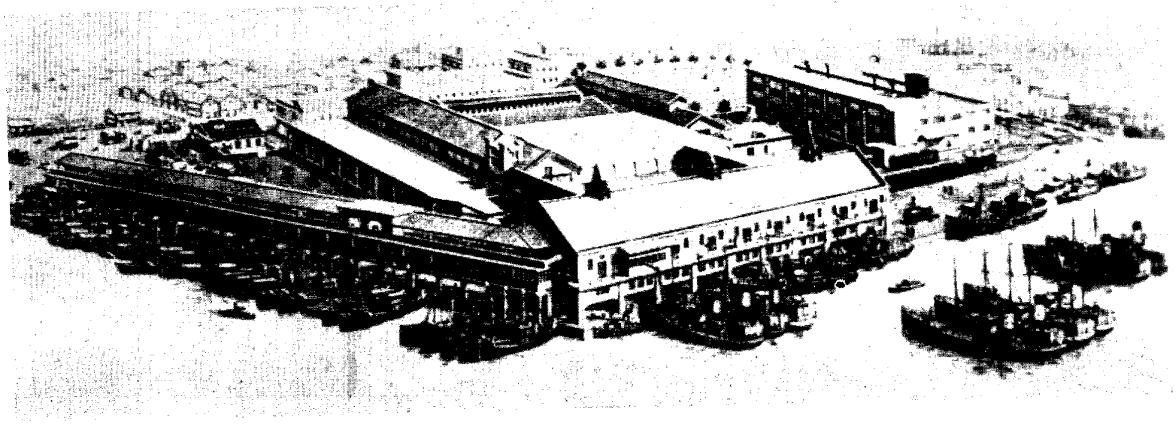

FIGURE VI - 4. *Wakamatsu-Yawata-Kokura.*
Tobata fishing wharf (probably Reference ㉖), looking eastward.

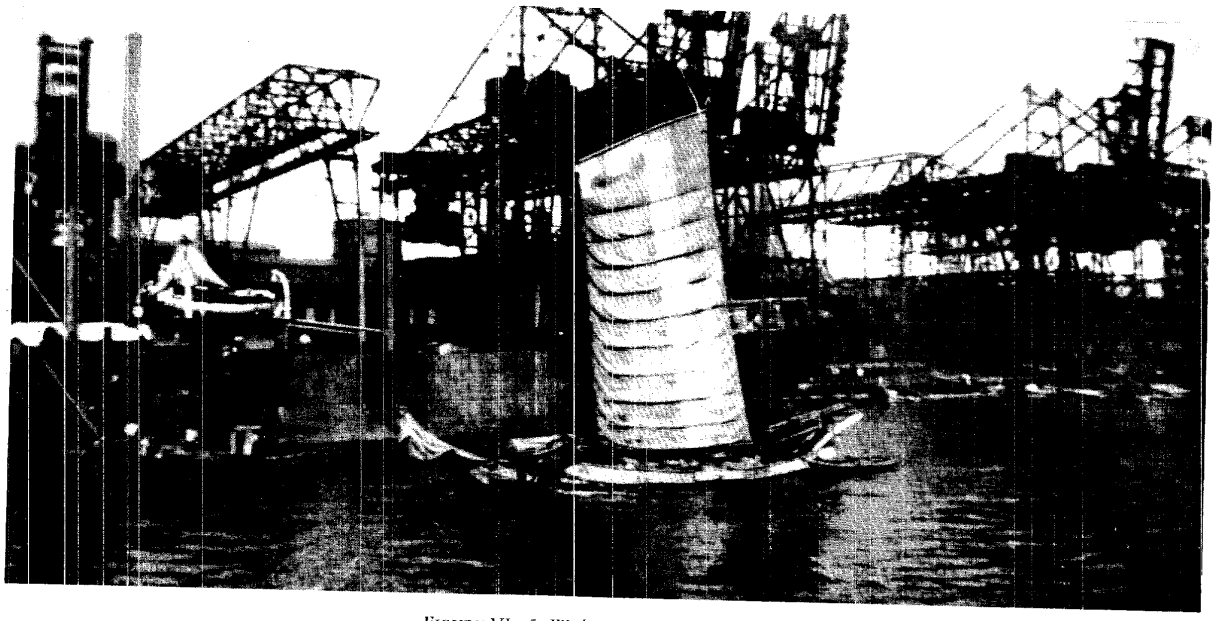

FIGURE VI - 5. *Wakamatsu-Yawata-Kokura.*
N side of inner harbor (Reference ㉗), showing coal loading bridge cranes and gantry yard cranes.

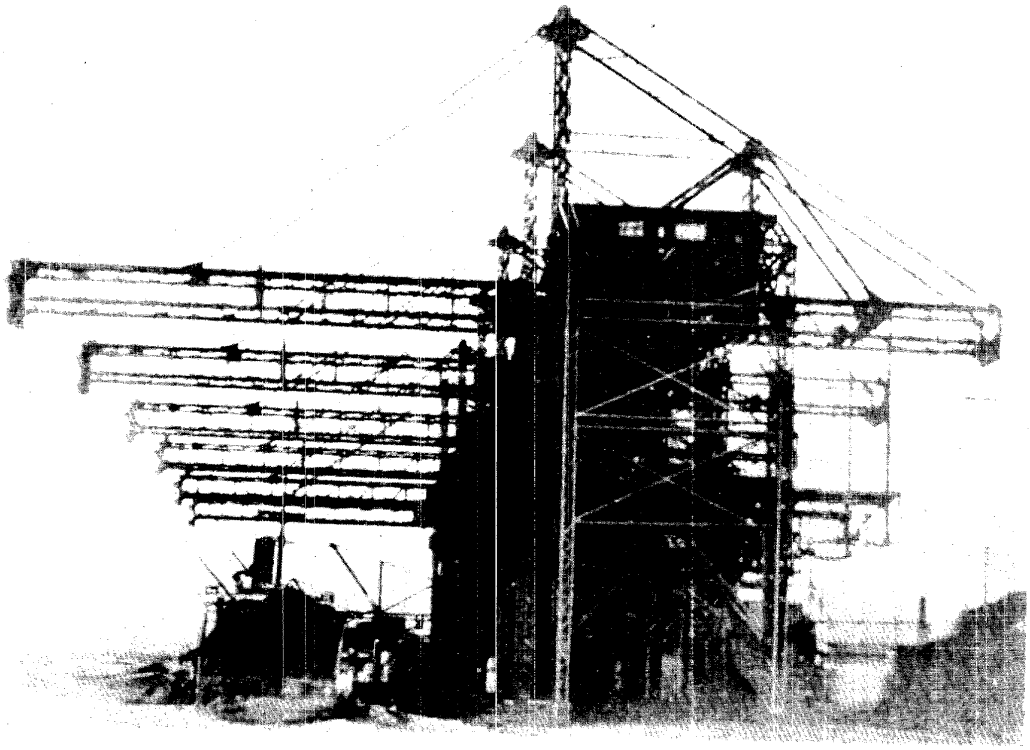

FIGURE VI - 6. *Wakamatsu-Yawata-Kokura.*
Five-ton stationary cranes near Imperial Steel Works at Yawata in westernmost basin of inner harbor (Reference ㊶).

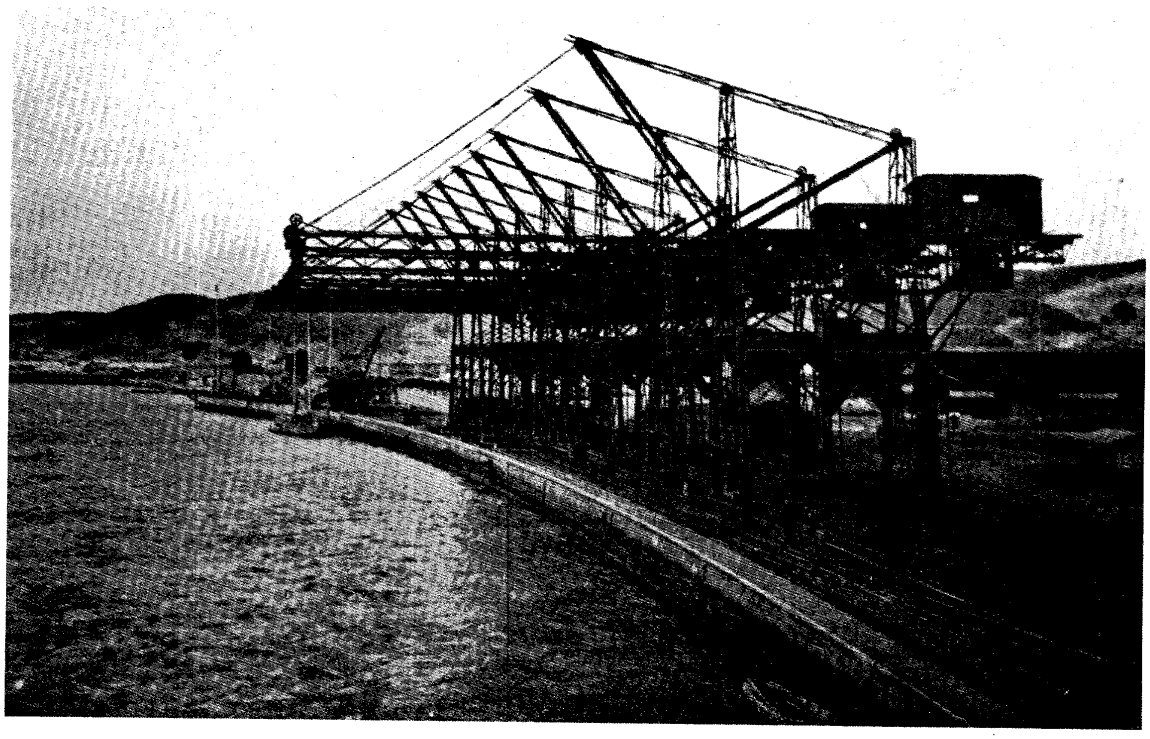

FIGURE VI - 7. *Wakamatsu-Yawata-Kokura.*
Nine traveling loading cranes on quay in inner harbor near Yawata steel works (may be at NE end of Reference ㊶).

All the points in this area are connected by railroad, and tracks are available at or near many of the port facilities (FIGURE VI - 8). Regular steamer communication is maintained with ports in the Inland Sea. Ferries run between Tobata and Wakamatsu. Nearby coal mines are connected to the port by railroad.

(*e*) *Supplies.* Water is available at the quays and also from waterboats. An unknown number of fuel oil tanks are available. There was an ample supply of coal. Both bunker and cargo coal are loaded manually at rates varying from 40 to 60 tons per hour, dependent upon the method of delivery and the type of vessel being loaded. The 3 travelling hydraulic coal hoists on the southeastern side of the main harbor (Reference ㉙) have a combined loading capacity of 6,700 tons per day. The 17 bridge cranes on the northern side of the inner harbor (Reference ㉗) have a loading capacity of 18,000 tons of coal per day.

(*f*) *Repair facilities.* The Tochigi Dockyard Co. has a 380-foot drydock at Wakamatsu. Three marine railways are charted on the extreme northwestern side of the eastern basin of the inner harbor. Recent aerial reconnaissance showed shipbuilding activity in the harbor area, including a yard for the construction of prefabricated steel cargo ships, several building ways, and 3 small boatyards.

(2) Fukuoka (33° 36′ N, 130° 24′ E).

Fukuoka is in the southeastern part of Fukuoka-wan (bay), on the northern coast of Kyūshū. The city adjoins Hakata to the westward, and is separated from it by the Naka-gawa (river). Other towns in the harbor area include Meihama, westward of Fukuoka; Hakozaki and Najima, northeastward of Hakata; and Saitozaki on the northern side of Hakata-ko, opposite Fukuoka. Hakata and Fukuoka are being developed principally as a coal exporting center for Kyūshū. It was reported in 1934 that the harbor facilities had been developed in excess of commercial needs. Practically all of the port facilities are in the southeastern part of the harbor, near the mouth of the Naka-gawa, where an artificial harbor is under construction. Extensive anchorage is available but only 1 quay, providing a berthage space of 1,312 feet in 25½-feet depths, can handle ocean-going vessels. Facilities for handling and storing oil are located at Saitozaki.

(*a*) *Harbor.* Hakata-ko comprises the 19,750-acre part of Fukuoka-wan lying eastward of Nokono-shima (island). It is about 8 miles long and 4½ miles wide at Nokono-shima, the western end; the width narrows to about 2¼ miles in the middle between the breakwaters and Saito-zaki (point) on the northern side of the bay (FIGURE VI - 9). Depths in the harbor are, in general, less than 5 fathoms, decreasing from 4½ fathoms in the western end to 1 fathom in the eastern, except for a limited area northeastward of Nokono-shima where the range is from 5 to 10 fathoms. It would appear that Hakata-ko would be completely sheltered from seas, but owing to its width there are times when cargo handling is impossible during strong winds between northward and westward.

1. BREAKWATERS. The artificial harbor is protected by breakwaters which form a semicircular barrier enclosing a water area with an approximate radius of ¾ mile. The central part of this area has been dredged; a depth of 24 feet is charted in the approach to the quay used by ocean-going vessels. The

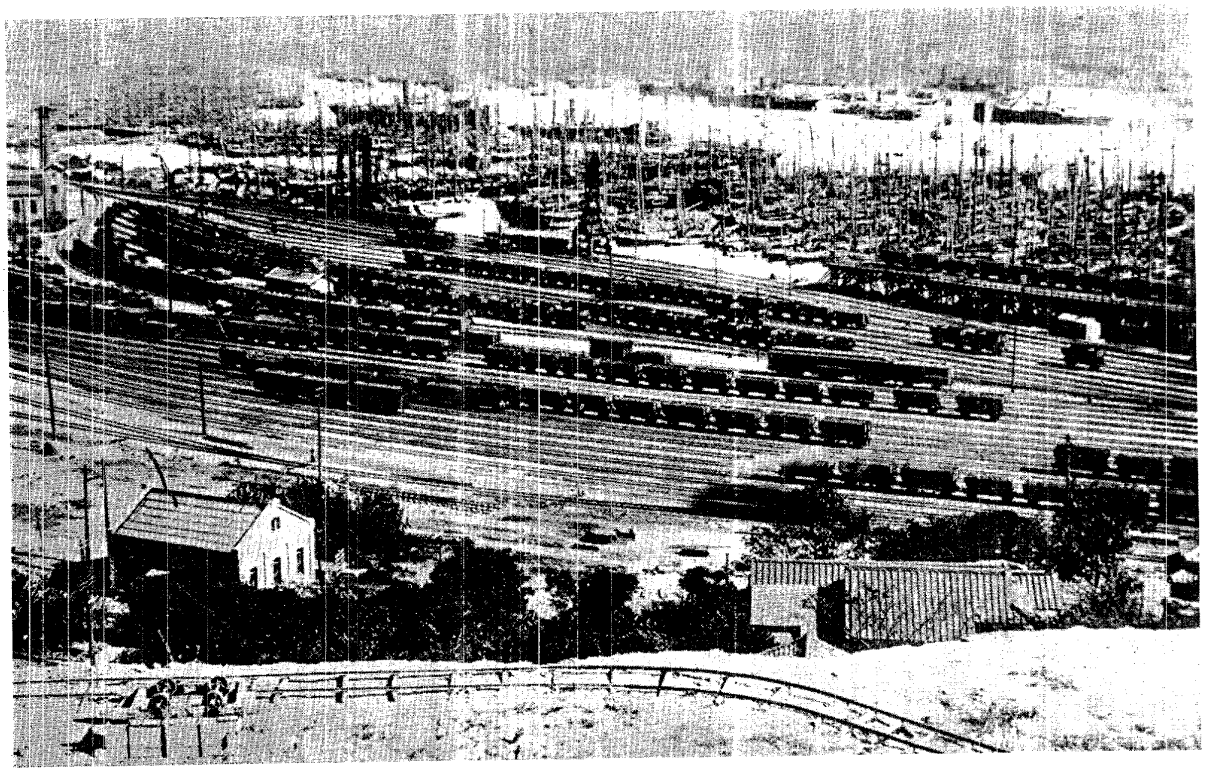

FIGURE VI - 8. *Wakamatsu-Yawata-Kokura.*
Railroad yards on Wakamatsu waterfront.

western breakwater extends northward and east-northeastward for about ¾ mile, from a position 1¼ miles west-northwestward from the mouth of the Naka-gawa. This breakwater was reported in 1941 as being extended southward to the shore. About 200 yards northeastward of its northern end, another breakwater was reported under construction in 1941; this would extend for almost 1 mile east-northeastward.

In addition to these 2 main breakwaters a secondary breakwater, which dries 1 foot, extends parallel to the eastern shore for about ⅝ mile. It is situated about ½ mile offshore, with its midpoint abreast of and about ¼ mile from the northeastern end of the breakwater under construction. The extensive reclaimed land fronting Hakozaki is protected by a series of breakwaters close to shore, three of which are detached. These are awash at low water.

A substantial area was being reclaimed northeastward of Najima and a large reclamation project was proposed on the northern side of the harbor eastward of Saitozaki.

2. BASINS. Fukuoka Municipal Basin, fronting Fukuoka, is L-shaped. The southern arm, about 440 yards long and 225 yards wide, has charted depths of 15 to 16½ feet. The northern arm is about 165 yards square with no data available regarding its depth. The entrance to this basin is about 70 yards wide and about 14 feet deep.

Hakata Municipal Basin, fronting Hakata, is about 575 yards long and 180 yards wide. Depths inside are believed to be about 9 feet, with shoaler water in the eastern corner. Both the inside and the outside of this basin appear to be quayed. The entrance is about 135 yards wide and 10½ feet deep.

The Hakozaki Fishery Association Basin, fronting Hakozaki at the reclaimed land, about 120 yards wide and 85 yards long on the northeastern side and 165 yards long on the southwestern side, has a depth of 6½ feet.

A small basin with a depth of 7½ feet is located at the seaplane base east of Myoken-shima.

3. ENTRANCE CHANNEL. The entrance channel, between the islands, Genkai-jima and Shiga-shima, has a least width of more than 1½ miles between the 5-fathom contour, and 9 fathoms in the fairway. Free from dangers, it is the channel used by ocean-going vessels. The 2 channels between Genkai-jima and Nishiura-misaki (point) should be used only by vessels with local knowledge. The northern of these has a least charted depth of 3¼ fathoms. An approach channel with a width of 175 yards and depths of 24 to 25½ feet was being dredged in 1938 for about 1 mile northwestward of the entrance between the 2 main breakwaters. The chart shows a depth of 19½ feet.

4. ANCHORAGE. Anchorage, governed by draft, can be had practically anywhere in Hakata-ko, but a position southwestward of Saito-zaki, in 3 or 4 fathoms, is recommended during strong northerly winds and off the eastern side of Nokono-shima in similar depths when strong westerlies prevail. Deep-draft vessels are restricted to the area northeastward of Nokono-shima in 5 to 10 fathoms. The bottom is mud, except close inshore where it is sand. Several mooring buoys were located in the southwestern part of the harbor, off the town of Meihama, and there are a number in the dredged area within the breakwaters. There also were several mooring buoys off Saito-zaki. The harbor affords sufficient room for about 16 first-class 41 second-class, and 420 third-class anchorage berths.

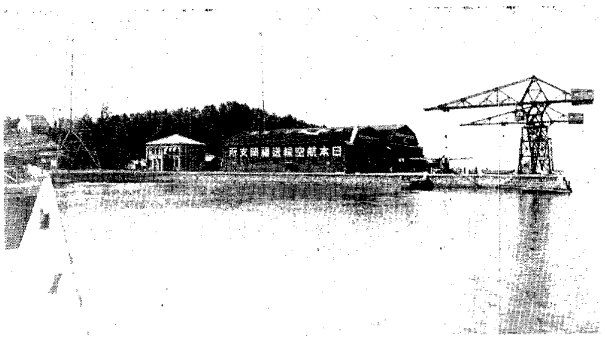

FIGURE VI - 10. *Fukuoka.*
Cranes at seaplane base, northward of Najima.

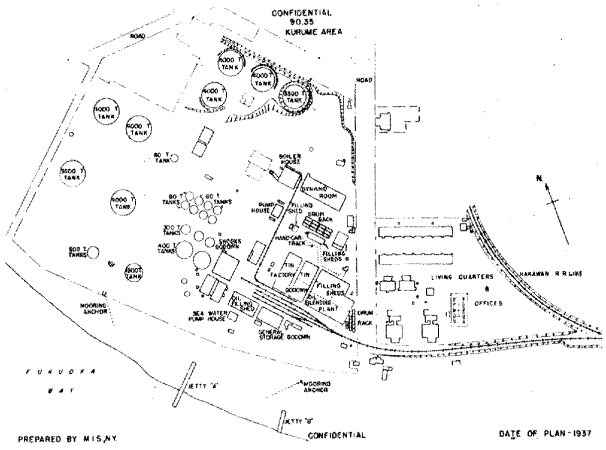

FIGURE VI - 11. *Fukuoka.*
Ground plan of Saitozaki installation, Rising Sun Oil Co. 1937.

5. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water interval in Fukuoka-wan is 9 hours, 24 minutes. Springs rise approximately 6¼ feet above lowest low water, neaps 4½ feet, and the mean tide level 3½ feet. The flood current sets southward in the entrance to Fukuoka-wan and southeastward in the vicinity of Nokono-shima, and the ebb sets in nearly opposite directions. The tide turns within 1 hour before high and low water, and both currents have a velocity of about 1 knot.

(*b*) *Landing facilities.* The quay immediately northward of the Hakata Municipal Basin is the only one capable of accommodating ocean-going vessels. It has a charted length of 1,640 feet, a berthage length of 1,312 feet, and a depth of 25½ feet alongside.

At Saitozaki there are 22 small piers used for loading coal lighters, and are equipped with belt conveyors. These piers are all served by the Hakata-wan Railway Ferry Company.

There are 2 cranes at the Japan Aerial Navigation Company's seaplane base, northward of Najima, in the northeastern section of Hakata-ko (FIGURE VI - 10).

In the harbor there are about 80 coal barges having a total capacity of 2,865 short tons, and 2 waterboats equipped with pumps.

(*c*) *Storage facilities.* The Rising Sun Oil Company has warehouses at Saitozaki having a total floor space of 8,400 square feet. It is probable that some of the recently reclaimed land in the area could be used for supply dumps.

The Rising Sun Oil Company also has the following storage tank facilities, which are located at the tank farm in the southwestern part of Saitozaki (FIGURE VI - 11).

TABLE VI - 2
OIL STORAGE AT SAITOZAKI NEAR FUKUOKA

NO. OF TANKS	UNIT CAPACITY (BARRELS)	TOTAL CAPACITY (BARRELS)
6	27,600	165,600
2	24,150	48,300
1	10,350	10,350
1	3,450	3,450
2	2,760	5,520
3	2,070	6,210
2	552	1,104
7	414	2,898
Total 24		243,432

(*d*) *Capacity and clearance.* The estimated unloading capacity of the port is 1,000 short tons per day. The average rate for discharging black products and kerosene at Saitozaki is 1,035 barrels per hour, and about 1,240 barrels of diesel oil per hour. Oil tankers anchor stern-to at the 200-foot floating pipeline on the eastern side of Saitozaki to load or discharge their cargo. There are three 8-inch lines for fuel oil and gasoline. The maximum rate of bunkering is 150 tons per hour.

Hakata is on the improved coastal highway leading westward to Sasebo; primary roads lead eastward to Wakamatsu and Moji, and southward to Saga and Kurume. Hakata and Fukuoka have extensive railroad connections. The northeastern and southeastern sides of the Hakata Municipal Basin and the lighter piers at Saitozaki are served by railroad (FIGURE VIII - 70).* Small steam vessels make several round trips daily between Saitozaki and Hakata-Fukuoka.

(*e*) *Supplies.* There is a city water supply at Hakata. Two waterboats with pumps have capacities of 44 and 33 short tons per hour, respectively. Water also is supplied at the Saitozaki piers; the daily capacity is about 110 short tons. There are 5 hydrants at the Fukuoka Municipal Basin, with a daily capacity of about 275 short tons (1935). The supply of bunker coal is practically unlimited. There is a station of the Naval Fuel Depot Colliery Division at Saitozaki. Oil also is available.

(*f*) *Repair facilities.* There is a graving dock at Hakata having an extreme length of 250 feet and bottom length of 230 feet. It has a top width of 40 feet, and the sill is approximately 0.8 feet below lowest low water. Two small building slips also are reported.

(3) Karatsu (33° 28′ N, 130° 00′ E).

Karatsu, on the northwestern coast of Kyūshū, is in the extreme southwestern part of Karatsu-wan. Large quantities of coal were shipped, prior to the depletion of nearby coal deposits. Good anchorage is available but the water alongside the facilities is not deep; there is berthing space for anly one 350-foot vessel drawing 20 feet.

(*a*) *Harbor.* Karatsu-ko, a natural harbor occupying the southwestern part of Karatsu-wan, is divided into 2 parts by O-shima (island) and the causeway that connects the island with the mainland; the western part is known as Nishi-ko and the eastern part Higashi-ko (FIGURE VI - 12). The general depths in Nishi-ko are from 24 to 30 feet; a depth of 24 feet has been maintained at the principal wharf and the approach

*Town plan of Fukuoka, Chapter VIII.

channel leading thereto. There is an average width of 1,000 yards between the 18-foot contours. Except in the approach channel, the 18-foot contour runs about ¼ mile from shore. Used principally by small craft, the depths in Higashi-ko are shallower; the 18-foot contour is about ¾ mile offshore. Between Tori-shima, an islet in the middle of Higashi-ko, and the mainland, there are depths of about 6 feet; depths of less than 18 feet are found between the mouth of Matsuura-gawa, a river flowing into the eastern part of Higashi-ko, and Taka-shima, a small island about 1½ miles to the northward.

Karatsu-ko is well sheltered from all winds, but with strong northerlies heavy seas run into Higashi-ko, making it difficult to work cargo.

There is a small artificially-sheltered basin at Nishi-Karatsu (Myoken) formed by land reclamation, a breakwater 100 yards long at its western entrance point, and a mole on its northeast side.

1. ENTRANCE CHANNEL. The fairway leading into Nishi-ko from Karatsu-wan is about 1,000 yards wide and has a depth of 33 feet at the harbor entrance. Higashi-ko is best entered from the northward, between O-shima and Taka-shima, about 1,450 yards apart. The general depths in this entrance are 30 to 34 feet; and depths of 24 to 28 feet are available within Higashi-ko as far southward as Tori-shima.

A boat channel, spanned by a railroad bridge, cuts the causeway from O-shima to the mainland and connects Nishi-ko and Higashi-ko.

2. ANCHORAGE. In Nishi-ko good anchorage can be obtained in depths of 3¾ to 5½ fathoms. The bottom is hard mud, mixed with fine sand. About 2 first-class, 3 second-class, and 14 third-class anchorage berths are available within the harbor limit.

During northerly winds, Higashi-ko is unsuitable as an anchorage for large vessels, but small craft can find anchorage sheltered by the islands. Native craft usually take shelter within the mouth of the Matsuura-gawa. The bottom in Higashi-ko is sand and mud. During favorable weather about 2 first-class, 6 second-class, and 5 third-class anchorage berths are available. Anchorage open to the northward can also be obtained to the eastward of Taka-shima.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The lunitidal high water interval is 12 hours, 26 minutes. Springs rise 8½ feet, neaps rise 5½ feet.

4. LOCAL WEATHER. The mean maximum temperature in August is 77°, and the mean minimum in February is about 43°. During the summer southerly winds prevail; during the other months northerly winds predominate except for January and February, when western winds are prevalent.

(*b*) *Landing facilities.* The terminal facilities are in the Nishi-Karatsu section of the port. The main quay (Reference ①)* provides berthing space for one 350-foot vessel drawing 20 feet, and two 200-foot vessels drawing 12 feet. The central mole (Reference ③) has berthing space on its easterly side for one 200-foot vessel drawing 12 feet. Another 200-foot vessel can be berthed at the bulkhead wharf (Reference ②) between the main quay and central mole.

Along the southwestern side of O-shima is a retaining wall, 2,700 feet long, from which project 6 small coaling piers, accessible only to lighters. Coal is unloaded from cars at a railway trestle located about 200 feet in the rear of the bulkhead.

Details of the principal wharves are shown in Table VI - 3.

*References are encircled numbers on Figure VI - 12.

TABLE VI - 3

PIERS, WHARVES, AND QUAYS AT KARATSU

Reference on FIGURE VI - 12 NAME	① MAIN QUAY	② BULKHEAD WHARF	③ CENTRAL MOLE		
Location on water front	Nishi-ko, SW side of east mole.	Nishi-Ko, adjoining main quay.	Nishi-Ko, W of main quay.		
Owned by	Japanese Government	Japanese Government	Japanese Government		
Purpose for which used	General cargo	No data	General cargo		
Type of construction	Believed to be masonry and concrete wall, retaining solid fill.	Believed to be masonry and concrete wall, retaining solid fill.	Believed to be masonry and concrete wall, retaining solid fill.		
Description	Face (ft.)	Face (ft.)	Face (ft.)	E side (ft.)	W side (ft.)
Dimensions	885	260	100	280	375
Depth of water	25 to 15	15	6½	15	less than 6
Berthing space available	885	260	100	280	375
Width of apron	60	No data	Open wharf		
Deck above L. W.	No data	No data	No data		
Capacity per square foot (lbs.)	Unlimited	No data	Unlimited		
Lighted or unlighted	No data	No data	No data		
Transit Sheds	2	No data	No data		
Type of construction	No data				
Length and width (feet)	Each about 300′ by 35′				
Total floor area (sq. ft.)	About 21,000				
Number of floors	Believed to be one				

TABLE VI - 3 *Continued*

PIERS, WHARVES, AND QUAYS AT KARATSU

Reference on FIGURE VI - 12	①	②	③
NAME	MAIN QUAY	BULKHEAD WHARF	CENTRAL MOLE
Height between floors	No data		
Allowable load per sq. ft. (lbs.)	Unlimited		
Lighted or unlighted	No data		
Mechanical handling facilities	Cranes believed to be available	No data	No data
Railway connections	No data	No data	No data
Water supply	No data	No data	No data
Electric current	No data	No data	No data
Estimated terminal capacity	850	240	240
Remarks	One 350-ft. vessel drawing 20′, and two 200-ft. vessels drawing 12′ can be berthed.	One 200-ft. vessel drawing 12′ can be berthed.	One 200-ft. vessel drawing 12′ can be berthed.

The western side of the basin at Nishi-Karatsu, southward of the breakwater, has an irregular outline but is believed to be quayed, with depths alongside under 6 feet. A float was maintained at the quay by the Mitsubishi. The Central Mole is on the east side of a boat passage connecting the main basin with Hirukobashi Basin, which lies to the southward. Hirukobashi Basin has an irregular shape and appears to be entirely quayed; depths alongside are under 6 feet.

There is reported to be a seldom-used quarantine pier, 118 feet long in shoal water, westward of the basin at Nishi-Karatsu.

At Tobo, about 1¼ miles northwestward of Nishi-Karatsu, a boat basin was reported (1938) to be under construction. The only facility previously available at this locality was a breakwater about 200 yards long, with a depth of about 1½ feet at its end.

In Higashi-ko there is a boat basin on the southeast side of O-shima. Charted depths are about 1½ feet, but land has been reclaimed at the site and the available depths may slightly exceed those charted.

Landing facilities available only to small craft are located within the mouth of the Matsuura-gawa; at the eastern entrance point of the river there is a small breakwater.

About 60 coal barges, averaging 95 short tons each in capacity, 2 water barges, and a small steam vessel of 18 gross tons, used as a tug, are in the harbor as well as a number of local fishing craft.

(*c*) *Storage facilities.* About 8 acres of open storage space is believed available on reclaimed land on the west side of the basin at Nishi-Karatsu. The open storage space at the Main Quay and on the central mole (References ① and ③) totals about 3 acres. About 14 acres of coal storage area is in the rear of the coaling piers at O-shima.

(*d*) *Capacity and clearance.* The unloading capacity of the port is estimated as 1,330 short tons per day.

Karatsu is connected to the Kyūshū railroad and highway systems. The principal wharves at Nishi-Karatsu are accessible to trucks.

(*e*) *Supplies.* Facilities for water supply to vessels include a water boat equipped with a pump and 2 tank boats; the total delivery rate is about 50,000 gallons per day. In 1936, the water was reported to be comparatively poor in quality, but the quality may have been improved by subsequent construction of a new municipal waterworks. Coal was brought by rail from the mines to the coal depot on the southwest side of O-shima, where it was loaded by hand into barges. Stocks of from 25,000 to 60,000 tons were formerly maintained, but the supply of coal available is reported to have sharply diminished. The rate of bunkering from barges is from 150 to 200 tons per hour.

(*f*) *Repair facilities.* Engine and boiler repairs might be undertaken by the West Karatsu Engine and Iron Works, believed located at Nishi-Karatsu.

(4) Sakito, on Kakinoura-shima and Sakito-shima (33° 01′ N, 129° 34′ E).

Sakito is on the western side of Kakinoura-shima and the eastern side of Sakito-shima, 2 islands off the northwestern coast of Kyūshū, south of the Sasebo naval base. It is a coal exporting port and has 4 mooring berths near belt conveyors. Three of these berths have depths from 23 to 30 feet.

(*a*) *Harbor.* Sakito-ko, a natural harbor, is formed by the western coast of Kakinoura-shima and the northern coast of Sakito-shima. Depths in the outer harbor diminish from about 78 feet in its entrance to about 37 feet at the entrance to the inner harbor; general depths of 27 feet or more are charted over most of the inner harbor. The shores of Sakito-ko, however, are generally fringed with reefs, particularly in the outer harbor (FIGURE VI - 13).

The roughly semicircular outer harbor has a radius of about 1,100 yards. Its southern shore is indented by 2 shallow coves, Amaniga-ura and Sugamuta-ura. In the inner harbor, the main channel follows a northeast course for about 1,200 yards in Fuku-ura, which has an average width of about 400 feet. Two narrow coves extend in opposite directions from a point about 500 yards within the inner harbor: Kakino-ura, 270 to 90 yards wide, extends northward about 600 yards; and Mizuno-ura, 120 yards wide in its entrance, extends south-southeastward about 700 yards.

The outer harbor is open to winds from west to north. Shelter against winds from that quarter can be found off the south shore of Kakinoura-shima, to the southeastward and eastward of the southern end of the channel between Sakito-shima and Kakinoura-shima. The inner harbor is protected by the land against winds from all directions.

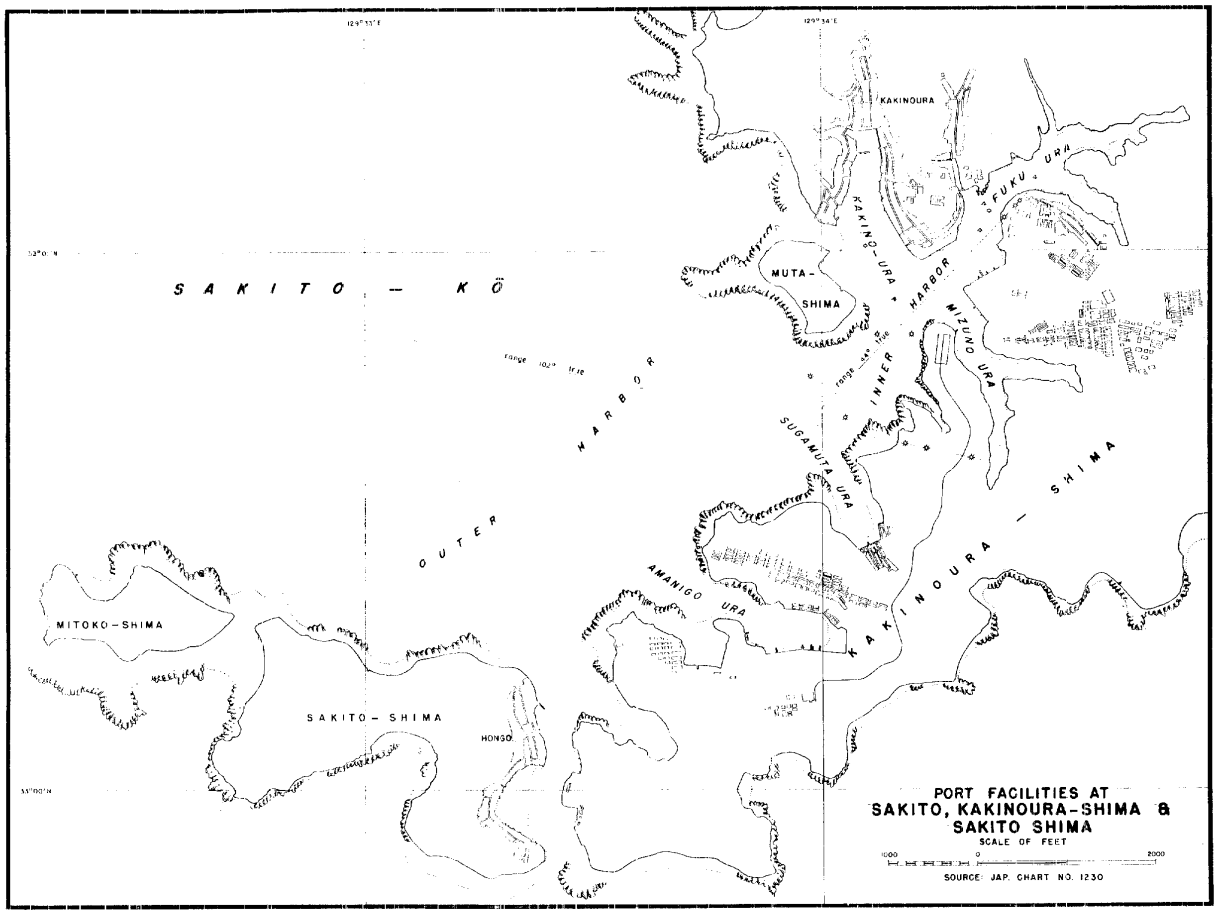

FIGURE VI - 13. *Sakito.*
Map of harbor, including waterfronts along Kakinoura-shima and Sakito-shima.

1. ENTRANCE CHANNEL. Depths along the range line of the entrance channel in the outer harbor decrease from 78 feet at the harbor limit to 37 feet at the entrance to the inner harbor. In the inner harbor, mid-channel depths of 30, 37, and 35 feet, respectively, are charted in the entrances to Kakino-ura, Fuku-ura, and Mizuno-ura.

2. ANCHORAGE. The outer harbor affords 2 first-class, 1 second-class, and 6 third-class anchorage berths. Two mooring buoys were anchored in Kakino-ura, in depths of 35 and 19 feet, respectively; they are 575 feet apart and can accommodate a large vessel. Several mooring buoys were placed in Fuku-ura, including 2 buoys used for securing the sterns of vessels moored at the quays.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The lunitidal high water interval is 8 hours, 18 minutes. Springs rise 10½ feet and neaps 7¾ feet. During ebb tides a strong southwesterly set may be experienced in the outer harbor.

(*b*) *Landing facilities.* Vessels loading coal moor slightly offshore at the coal conveyors. The 4 mooring berths at the coal conveyors are numbered consecutively.

No. 1 berth is at the western entrance point of Mizuno-ura. Used by large vessels, it is served by 2 belt conveyors. Depths at the conveyors appear to be about 27 feet.

No. 2 berth, on the opposite shore of Mizuno-ura, about 120 yards to the northeastward, is reported used by small vessels. The loading equipment consists of 1 belt conveyor. The mooring berth is about 325 feet long and 26 to 30 feet deep.

No. 3 berth extends along the south shore of Fuku-ura eastward from the eastern entrance point to Mizuno-ura. It is used by large vessels. The loading equipment consists of 2 belt conveyors. The mooring berth is about 400 feet long and has a depth of about 23 feet.

No. 4 berth is believed to lie northward of the eastern end of No. 3 berth. It is used by small vessels. Loading equipment consists of 1 belt conveyor.

A mooring berth, at the anchorage inside Kakino-ura, is used by large vessels. Additional mooring buoys were located in Fuku-ura. Vessels at the mooring berths load from lighters, the largest of which is equipped with coal loading machinery.

The waterfront of Kakino-ura appears to be entirely quayed, for a total length of roughly 4,400 feet, but most of this quayage has depths of less than 3 feet alongside and is not known to be usable wharfage. About 650 feet of quayage has depths alongside of 6 to 11 feet.

A floating pier, in shallow water on the western shore of Kakino-ura, is used as a landing.

A small pier is charted at the head of Sugamuta-ura. The northern shorefront of Amaniga-ura appears to be quayed, but the depths alongside are less than 3 feet. On the southern side of the cove 7 piers are accessible to craft able to pass over a bar

across the outer part of the cove having a least depth of 6 feet. At Hongo, on the east shore of Sakito-shima, there is a shallow bight with depths of less than 3 feet; along the shore are numerous landings for small boats.

Lighters and coal barges are available. The largest of the coal barges has a carrying capacity of about 1,000 tons. There also are 20 water boats and 2 tugs, one of 135 and the other of 99 gross tons.

(*c*) *Storage facilities.* Several terminals have open storage space for coal.

(*d*) *Capacity and clearance.* There are no roads on Kakinoura-shima. A system of railroad tracks connects the mines with the south shore of Sakito-ko. The port has regular steamer service, daily connection with the naval base of Sasebo, and ferry service across Fuku-ura.

Sakito is a specialized port, with facilities designed primarily for loading bulk coal; it is impractical to estimate the unloading capacity for general cargo discharged at vessel berths. Vessels alongside the quays can be bunkered at the coal conveyors at the rate of from 200 to 300 tons per hour. Vessels moored at the buoys can be bunkered from lighters and coal barges, the largest of which has a capacity of about 1,000 tons and is equipped with a bucket elevator and belt conveyor, having a loading capacity of about 150 tons per hour.

(*e*) *Supplies.* There is practically no fresh water available at Sakito, but river water of good quality is transported by water boats from the head of Nanatsugama-ura, on the mainland about 5 miles eastward of Sakito. Two of these boats, equipped with pumps, can supply water at respective capacities of about 10,500 and 5,000 gallons per hour. In addition there are 15 boats, each of about 13,000 gallons carrying capacity, and 3 boats, each of about 5,000 gallons carrying capacity, from which water can be supplied at the rate of about 105,500 gallons per day. Coal is available in unlimited quantities. Minor repairs can be made.

(5) Nagasaki (32° 43′ N, 129° 50′ E).

On the west coast of Kyūshū, Nagasaki is one of the 3 major Japanese shipbuilding centers. It has a large, well-sheltered harbor that provides good anchorage in both inner and outer harbors. Virtually the entire inner harbor is spotted with piers, wharves, quays, shipyards, drydocks, cranes, and other port facilities, but only one 1,380-foot commercial wharf with a 29½-foot depth is reported capable of handling deep draft, ocean-going vessels. Two shipyard wharves have depths ranging from 16½ to 33 feet and extensive crane installations. Seventeen other landing facilities are listed in this description of Nagasaki, but depths alongside are unknown. A number of mooring buoys were in the harbor, and the presence of 500 lighters as well as towboats, water, coal, and oil barges can be assumed to increase the unloading capacity of the port beyond the estimated 2,200 short tons per day that can be handled at the 3 principal wharves.

Repair work on some of the largest vessels afloat can be made at Nagasaki. The Nagasaki shipyards of the Mitsubishi Company 2 miles of waterfront and the Kawaminoni shipyard has extensive installations on Koyagi-shima. Oil installations around the harbor have a capacity of more than 550,000 barrels; coal supply and handling facilities are abundant.

(*a*) *Harbor.* Nagasaki-ko is a large, well-sheltered harbor, surrounded by mountains on all but the southern side. The harbor is divided into 4 districts: the First and Second Districts are referred to as the inner harbor; and the Third and Fourth Districts as the outer harbor (FIGURE VI - 14). The main fairway in the Fourth District, about 250 yards wide between 18-foot contours around the small islands, Tozo-sho and Kajikake-sho, has central depths of 60 to 72 feet, increasing to 90 feet at the southern limit of the Third District. The Third District is about 1,800 yards across in each direction outside the 18-foot contour, at which point the bottom, as a rule, drops off rather steeply to deep water. Central depths range from 60 to 144 feet.

The inner harbor extends about 4,200 yards in a north-northeasterly direction; widths inside the harbor vary up to 1,200 yards. The 18-foot contours, except at the head of the harbor, are generally within 50 yards of the beach. Central depths range from 96 feet at the entrance to 18 feet near the head. The 30-foot contour is about 800 yards below the head of the harbor. There are no hidden dangers.

1. ENTRANCE CHANNEL. Nagasaki-ko has 2 entrances among obstructions formed by several rocky islands and shoals.

The entrance from the west, which is easy of access, has a least width of 600 yards between the 60-foot contours adjacent to the islands, Takaboko-shima and Kagenoo-shima at a point immediately outside the harbor limits. Depths range up to 144 feet with no hidden dangers. The shores are bordered by shoals and drying reefs that drop off steeply to deep water.

The entrance from the southwest through Koyagi-seto lies between Nagasaki-hanto, Koyagi-shima, and Kagenoo-shima. Immediately inside a number of islands and hidden dangers form 3 narrow, tortuous channels. The northwestern channel has a least width of 70 yards with a controlling middle depth of 27 feet; the middle channel has a least width of 30 yards and a controlling depth in mid-channel of 21 feet; and the southeastern channel has a least width of 60 yards and a controlling middle depth of 31½ feet, all outside the 18-foot contours.

2. ANCHORAGE. Anchorage can be had in almost any part of the inner harbor in depths of 3½ to 15 fathoms, over good holding ground of mud. Outside the buoyed area there are six 200-yard berths available for anchorage in depths of 5½ to 13 fathoms, over mud. In the outer harbor there are 5 first-class berths in areas clear of submarine cables in depths of 11 to 17 fathoms over mud and sand, but one of the berths requires swinging over the 5½-fathom rock in O-sone. A variety of 150- to 200-yard berths are available outside submarine cable areas in coves and recessions in the outer harbor.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The tide at Nagasaki is semidiurnal. The lunitidal interval is 7 hours, 56 minutes with a spring rise of 9½ feet above the datum of soundings. The height of water level is affected to a marked degree by seiches, in periods that vary from 32 to 36 minutes, which sometimes cause a variation up to 2 feet from normal. The most pronounced of these oscillations occur when there are 2 localized areas of low pressure in the vicinity. Tidal currents in Koyagi-seto, with a velocity of more than 1 knot, set northeastward on the flood and southwestward on the ebb, turning about the time of high and low water.

4. LOCAL WEATHER. Except at times during the rainy season, the weather does not ordinarily interfere with working cargo. Storms, which occur at rare intervals, do considerable damage. The mean annual temperature is 61.5°, the mean

maximum 68.9°, and the mean minimum 53.9°. The average annual rainfall is 77 inches with a maximum of 13.2 inches in June and a minimum of 2.9 inches in January. The relative humidity is 89 to 90% in the morning during June and July and 57% in the afternoons of October. The prevailing wind is northeast to north during autumn and winter and north through west to southwest during spring and summer.

(*b*) *Landing facilities.* The more important port facilities are located in the inner harbor along the eastern side where the principal commercial section of the town is located. The western side of the inner harbor is occupied by shipyards and oil and coal storage facilities. The only cargo wharf capable of accommodating ocean vessels is at Deshima, on the eastern side of the inner harbor, at the mouth of Nakajima-gawa (Reference ⑱).*At the shipyard on the western side of the inner harbor there are wharves with charted depths of 13½ to 33 feet (References ② and ⑦); one (Reference ⑦) is equipped with a 150-ton crane (FIGURE VI - 15).

The chart shows a large amount of waterfront space that is seemingly improved with seawalls but it is probable that a substantial portion of the improvement consists of a rock revetment. Only those spaces known to be of maritime importance, combined with those that might be reasonably assumed to have either commercial or maritime value, are described. There are no important landing facilities in the outer harbor; the developed shore line is occupied primarily by shipyards and coal and oil installations.

There were 11 mooring buoys in the vicinity of the approximate center line of the northern part of the inner harbor, and 3 located west of the fairway in the southern part. Private mooring buoys were located as follows:

TABLE VI - 4

PRIVATE MOORING BERTHS AT NAGASAKI

NUMBER OF BUOYS	MAINTAINED BY	LOCATION
	Outer Harbor	
1	Standard Oil Co.	Inside Kibachi-ura
	Inner Harbor	
2	Customs	Inside Nishidomari-ura
2	Mitsubishi Dockyard	NE of Totegami-ura
3	Mitsubishi Dockyard	Akuno-ura, S of quay (Reference ⑦)
1	Mitsubishi Dockyard	Mizuno-ura
2	Mitsubishi Dockyard	Mizuno-ura (fixed mooring for floating crane)

The principal facilities are described in TABLE VI - 5. In the inner harbor there are numerous wharves and pontoons for small vessels. Some of the more important are listed in TABLE VI - 6. Depths alongside are not definitely known.

Six cranes of unknown characteristics are located on the waterfront facilities of the Mitsubishi Dockyard, in the northwestern corner of the inner harbor, and 6 additional cranes, on which no details are available, are located along the eastern side of the inner harbor. Other fixed and locomotive cranes are available at the shipyard. Hand cranes, owned by the Customs authorities, are reported on some of the commercial wharves.

Three floating cranes, having capacities of 150, 60, and 40 tons, respectively, are based at the Mitsubishi Dockyard. Two floating cranes of 50 and 40 tons capacity, respectively, are reported at Deshima Quay (Reference ⑱), but their existence has not been confirmed.

*References are encircled numbers on FIGURE VI - 14. The numbers run consecutively starting on the southwestern side and moving around the inner harbor.

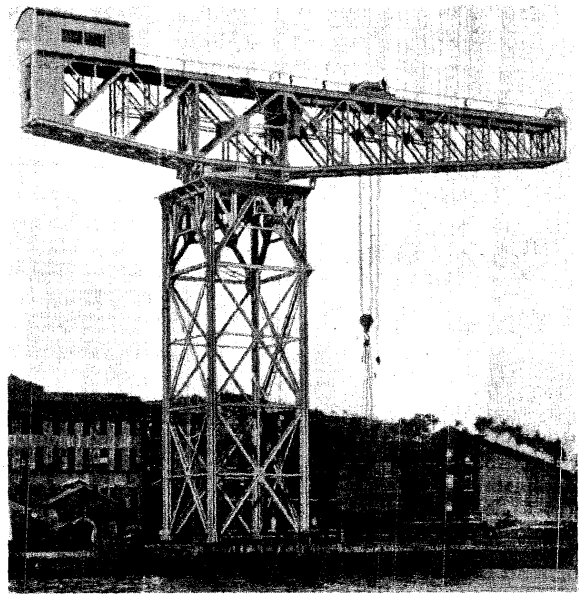

FIGURE VI - 15. *Nagasaki.*
Wharf at Mitsubishi dockyard (Reference ⑦) showing 150-ton hammer head crane. 24 June 1910.

A number of towboats and more than 500 lighters are available for the handling of cargo between ship and shore. There also are six 80-ton water barges, some 400-ton oil barges, and a number of 25-ton coal barges in the harbor.

(*c*) *Storage facilities.* Numerous warehouses of indeterminate space are available. On Deshima Quay (Reference ⑱) there are a number of one-story wooden structures up to 262 feet long. Large areas that could be used as supply dumps are maintained by coal companies on the western and eastern shores of the southern end of the inner harbor.

(*d*) *Capacity and clearance.* The unloading capacity of the port is conservatively estimated to be 2,200 short tons per day handled at the 3 principal landing facilities described in TABLE VI - 5.

Deshima Quay (Reference ⑱) and the small boat wharves at the north shore of the harbor are connected by road and railroad with other parts of Kyūshū (FIGURE VIII - 78)*. Communication by steamship is maintained with other parts of Japan and with all parts of the world.

(*e*) *Supplies.*

1. WATER. Potable water, from an ample supply furnished by reservoirs, is delivered through 10 hydrants on Deshima Quay (Reference ③) with a capacity of 50 tons per hour, and through 1 hydrant on Municipal Floating Pier No. 1 (Reference ⑮) with a capacity of 30 tons per hour. Of the 6 water boats in the harbor, 2 have pumps with a capacity of 40 tons per hour. A water pipe line extends to the 3-fathom contour off Doinokubi on the southeastern side of the outer harbor.

2. OIL AND GASOLINE. Heavy and light fuel and lubricating oils are supplied mainly by tank farms located on Kozaki-hana with frontage on both the inner and outer harbors.

*Town plan of Nagasaki, Chapter VIII.

TABLE VI - 5

PRINCIPAL PIERS, WHARVES, AND QUAYS AT NAGASAKI

Reference on FIGURE VI - 14 NAME	② SHIPYARD WHARF	⑦ SHIPYARD WHARF	⑱ DESHIMA QUAY
Location on waterfront	Tategami-ura	Akuno-ura	Waterfront of Dejima
Purpose for which used	Fitting out quay	Shipyard facility	General cargo
Type of construction	Quay wall, solid fill.	Masonry quay wall, solid fill.	Quay wall, solid fill.
Description	Face (ft.)	Face (ft.)	Face (ft.)
Dimensions	780	475 + 300 + 80 + 150 + 300	1380
Depth of water	13½ to 21	6 to 33	29½
Berthing space available	780	250 + 80 + 150 + 300	1380
Width of apron	Open	Open wharf	50 to 70
Transit sheds	No data	No data	No data
Mechanical handling facilities	1 locomotive crane	One 150-ton hammerhead fixed crane	Several 5-ton hand operated cranes
Railway connections	None	None	Terminus of rail switch tracks on wharf, in rear of buildings.
Water supply	No data	No data	10 hydrants; capacity 50 tons per hour.
Electric current	No data	No data	No data
Estimated terminal capacity	500	500	1,200
Remarks	Berthage: Two 250-ft. vessels drawing 16′.	Face of quay is irregular and obstructed by small fixed and floating piers. Berthage: One 250-ft. vessel drawing 16′; one 200-ft. vessel drawing 12′ (FIGURE VI - 15).	Several warehouses on quay. Berthage: Two 450-ft. vessels drawing 26′; one 250-ft. vessel drawing 16′.

TABLE VI - 6

SECONDARY LANDING FACILITIES IN NAGASAKI INNER HARBOR

NAME AND REFERENCE ON FIGURE VI - 14	LOCATION	REMARKS
	Western Shore	
Otao Coal Dump Embankment ①	Extending N from southern limit of inner harbor to Suzure Zaki	Coal storage areas of Mitsui Bussan Kaisha, Mitsubishi Kogyo Kaisha, and Asahi Petroleum Co.
Tategami Pier ③	Tategami-ura, S of Graving Dock No. 1	Operated by Mitsubishi Dockyard
Mizuno-ura Pier ⑧ (FIGURE VI - 16)	SW corner Mizuno-ura	Operated by Mitsubishi Dockyard
Municipal Floating Pier ⑨	NW corner Mizuno-ura	Mizuno-Ura — Ohata ferry terminal
Municipal Floating Pier ⑩	800′ SW of mouth of Uragami-gawa	Asahi Machi — Ohata ferry terminal
Municipal Floating Pier ⑪	W entrance to Uragami-gawa	Shiga—Motofunamachi ferry terminal
	Northern Shore	
Dept. of Rwys. Wharf ⑫	S side Nakano-shima	W side fronts on Uragami-gawa
Dept. of Rwys. Wharf ⑬	NE corner inner harbor	Fish market on wharf
	Eastern Shore	
Municipal Floating Pier ⑭	NE corner inner harbor	Motofunamachi—Shiga ferry terminal

TABLE VI - 6 *Continued*

Municipal Floating Pier No. 1 ⑮	1,200′ S of head of inner harbor	Kyūshū S.S. Co. building near root of pier
Municipal Floating Pier No. 2 ⑯	200′ S of Municipal Floating Pier No. 1	Terminal of Ohata—Asahi-machi and Ohata—Mizuno-ura ferries
Municipal Floating Pier No. 3 ⑰	200′ S of Municipal Floating Pier No. 2	—
Customs Wharf ⑲	S of Deshima Quay	—
Customs Floating Pier No. 4 ⑳	Fronting U. S. Consulate	—
Customs Floating Pier No. 6 ㉑	S side of mouth of Matsugae-gawa	—
Floating Pier ㉒	2,200′ SW of Customs Floating Pier No. 4	Operated by Mitsubishi Mining Co.
Mitsubishi Coal Dump Embankment ㉓ (FIGURE VI - 17)	W side of Tanoo Yama	Coal storage

Other smaller tank farms are located on or near the south shore of Nishidomari-kahuchi, and the north and west shores of Megami-hana. Barges might be able to moor to the oil wharves but all transfer of liquid cargo between ship and shore is by means of floating pipe lines. Known details of tank farms are described in the following table:

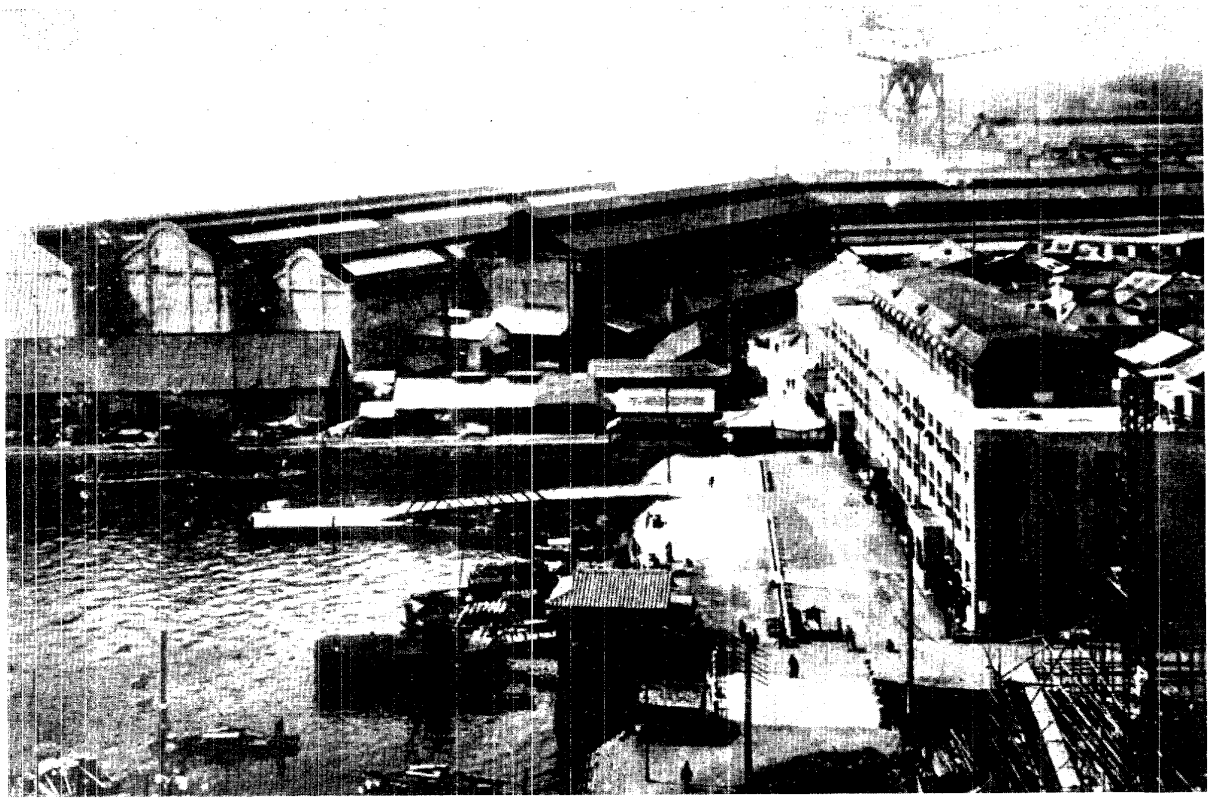

FIGURE VI -16. *Nagasaki.*
Mizuno-ura pier (Reference (8)), looking southward.

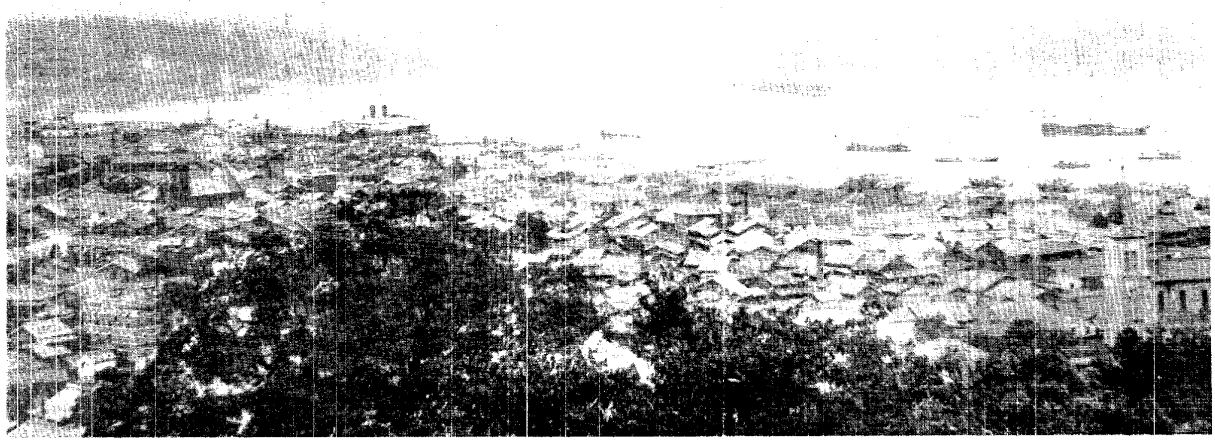

FIGURE VI - 17. *Nagasaki.*
Looking southwestward across Mitsubishi coal dump (Reference (23))
toward entrance into inner harbor.

TABLE VI - 7

TANKAGE INSTALLATIONS AT NAGASAKI

NAME OF COMPANY	NUMBER OF TANKS	STORAGE CAPACITY BARRELS
Standard	7	173,190
Mitsui	6	73,830
Rising Sun (Shell)	6	103,500
Hayashikane	5	63,480
Asahi Benberg	3	14,490
Japan Oil Co.	3	43,470
Mitsubishi	3	84,870
TOTALS	33	556,830

Two other Rising Sun (Shell) installations are reported, but the number of tanks and their capacities are indefinite.

3. COAL. There are abundant stocks of coal; the greater part was maintained by 2 coal companies with supply yards located between Kozaki-hana and Suzure-saki on the west shore of the inner harbor. One of these companies also has a yard on the east shore of the inner harbor, near Tanoo-yama. All coaling is done by coolie labor, using baskets from 25-ton lighters. One gang of 30 men can load and trim 6 tons per hour.

(f) Repair facilities.

1. DRYDOCKS. There are 3 drydocks at the Mitsubishi Dockyard on the western side of the inner harbor (FIGURES VI - 18 and VI - 19), and an additional 3 at the Kawaminani Shipyard on the east coast of Koyagi-shima, near the southern limit of the outer harbor. Known details of these facilities are described in TABLE VI - 8.

2. MARINE REPAIR PLANTS. Repair work on some of the largest vessels afloat can be executed at Nagasaki. One of the most important shipyards of Japan, The Mitsubishi Company (Nagasaki Dockyards), has building slips, drydocks, a marine railway, and attendant machine shops, engine plants, saw mills, and steel works, that occupy about 2 miles of waterfront on the west shore of the inner harbor (FIGURES VI - 20 through VI - 22). The machine shop is equipped with several 50- and 100-ton overhead traveling cranes. The Mitsubishi Company also has a large machine shop and torpedo and armament plant about a mile north of the harbor.

The Kawaminoni Company has a large engine factory and manufacturing plant at Inasa on the west shore, at the head of the inner harbor, and a shipyard with building slips, drydocks, and a marine railway at Nagahama on Koyagi-shima, bordering the west side of the outer harbor.

Floating cranes and a steam tug are available for salvage and repair work.

3. MARINE RAILWAYS. TABLE VI - 9 lists available details on 2 of a reported total of 3 or 4 marine railroads.

TABLE VI - 8

DRYDOCKS AT NAGASAKI

Reference in FIGURE VI - 14 NAME	④ DRYDOCK NO. 1	⑥ DRYDOCK NO. 2	⑤ DRYDOCK NO. 3
Owned and operated by	Mitsubishi Co.	Mitsubishi Co.	Mitsubishi Co.
Location on waterfront	W side inner harbor	W side inner harbor	W side inner harbor
Drydock			
Type	Graving-granite blocks	Graving-granite blocks	Graving-granite blocks
Entrance—			
Width at coping	89.0′	66.0′	96.8′
Width, 6′ above sill	77.0′	53.0′	88.5′
Body of dock—			
Length, coping head to side of caisson	523.0′	371.0′	728.7′
Length of keel block	513.0′	350.0′	714.0′
Width at coping	No data	No data	No data
Depth on keel blocks, M.H.W.	26.5′	24.0′	34.5′
Mean rise and fall of tide	5.6′	5.6′	5.6′
Crane service	None	None	None
Date built	No data	No data	No data
Remarks	(FIGURE VI - 18)	—	(FIGURE VI - 19)

TABLE VI - 8 *Continued*

DRYDOCKS AT NAGASAKI

NAME	NO DATA	DRYDOCK NO. 1	NO DATA
Owned and operated by	Kawaminoni Co.	Kawaminoni Co.	Kawaminoni Co.
Location on waterfront	Nagahama, E side of Kōyagi-shima.	Nagahama, E side of Kōyagi-shima.	Nagahama, E side of Kōyagi-shima.
Drydock			
Type	Graving	Graving	Graving
Entrance—			
Width at coping	No data	48.1′	No data
Width 6 feet above sill	36.5′	40.0′	No data
Body of dock—			
Length, coping head to side of caisson	250′	352.0′	730′
Length on bottom	No data	338.0′	No data
Width at coping	No data	No data	120′
Depth on keel blocks, M.H.W.	18.6′	18.0′	No data
Mean rise and fall of tide	5.6′	5.6′	5.6′
Crane service	No data	No data	No data
Date built	No data	No data	1939
Remarks	—	—	Reported large enough to take a 35,000-ton ship (1941).

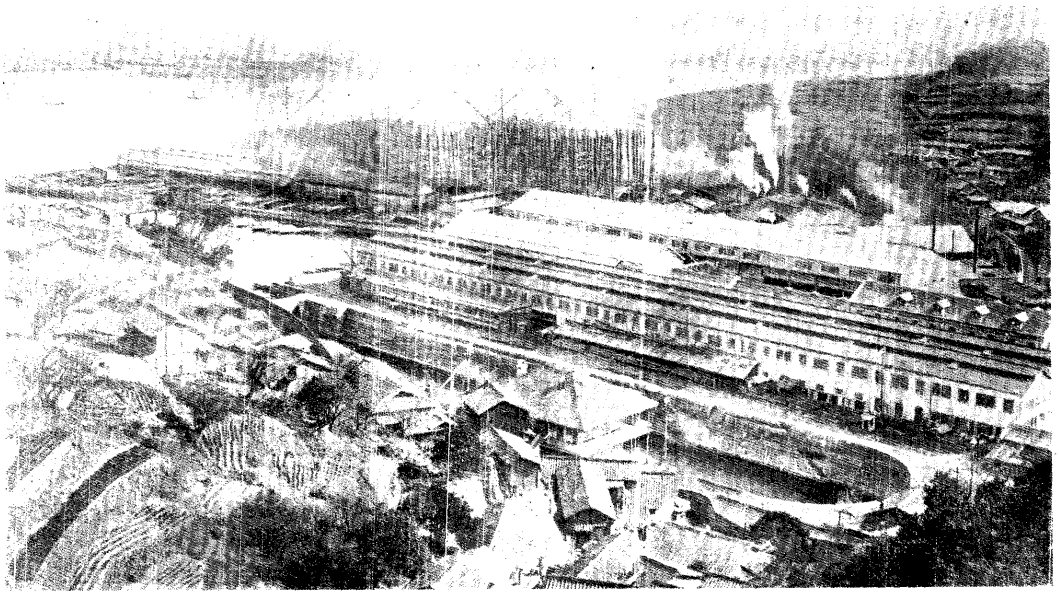

FIGURE VI - 18. *Nagasaki.*
Mitsubishi drydock No. 1 (Reference (1)).

TABLE VI - 9

MARINE RAILWAYS AT NAGASAKI

NAME	NO DATA	NO DATA
Owned and operated by	Mitsubishi Co.	Kawaminoni Co.
Location on waterfront	Kosuge, E side of inner harbor, on N side of Tonoo-yama.	Nagahama, Koyagi-shima
Marine Railway Length of track	750	160
Length of cradle	No data	No data
Width of cradle at top of keel blocks	No data	No data
Depth over keel blocks in outboard position at M.H.W.	No data	No data
Forward	No data	No data
Aft	No data	No data
Mean rise and fall of tide (ft.)	5.6	5.6
Lifting power in tons	1,000	350
Crane service	No data	No data

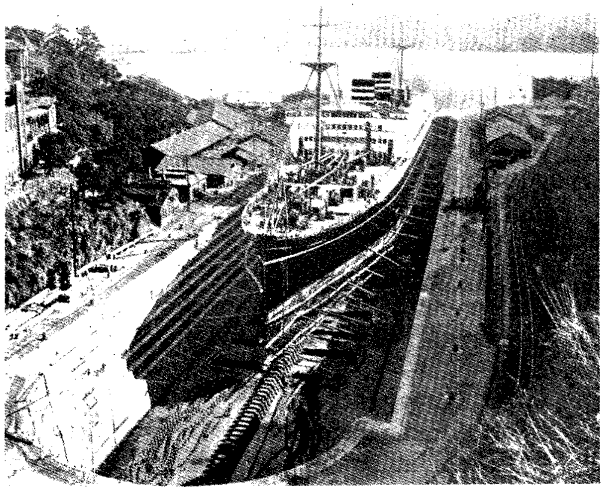

FIGURE VI - 19. *Nagasaki.*
Mitsubishi drydock No. 3 (Reference ⑤).

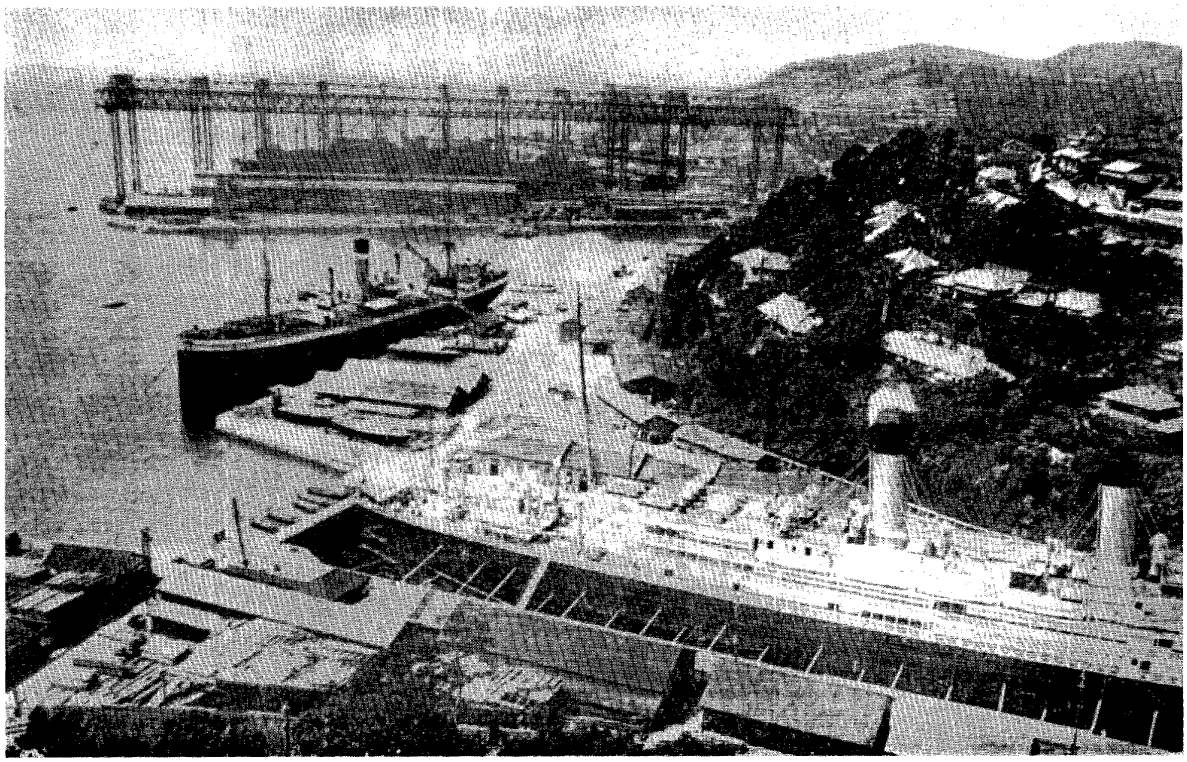

FIGURE VI - 20. *Nagasaki.*
Mitsubishi shipyard, looking southward from drydock No. 3. 1930. Gantry crane over first and largest of building ways.

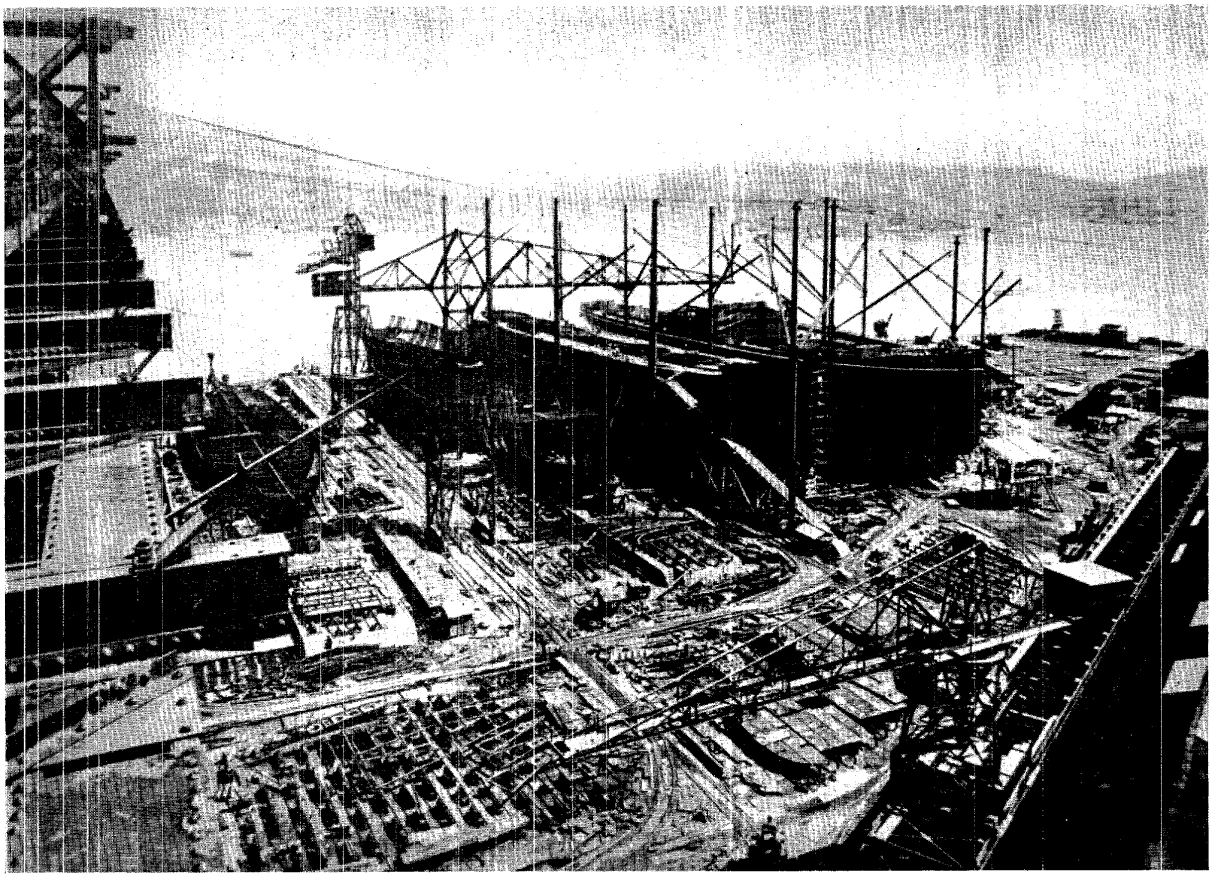

FIGURE VI - 21. *Nagasaki.*
Mitsubishi shipyard, building ways on other side of gantry crane shown in FIGURE VI - 20.

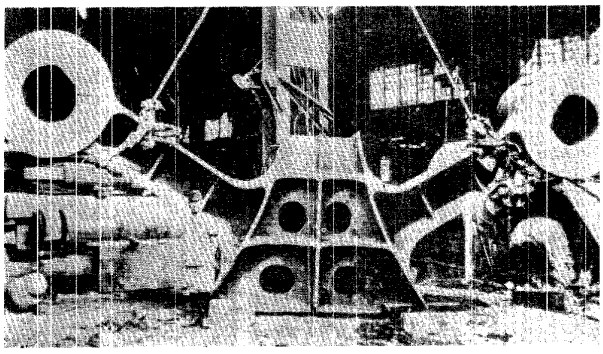

FIGURE VI - 22. *Nagasaki.*
Shaft bracket for Japanese ocean liner, probably at Mitsubishi dockyard plant.

(6) Ōmuta-Miike (33° 00′ N, 130° 25′ E).

The mining and manufacturing city of Ōmuta and the adjacent coal port of Miike are on the middle of the eastern shore of Shimabara-kaiwan, about 60 miles from the open sea. This industrial section, virtually owned by the Mitsui interests, has 2 of the largest zinc refineries in Japan, a synthetic oil and coal tar derivative plant, sulphuric acid and cotton industries, and coal mines.

A drying mud flat extends 1½ to 2 miles offshore; the landing facilities at both Ōmuta and Miike are approached through artificial channels across the flat. The channel to Ōmuta has very shallow depths, but the channel to Miike, the site of the important landing facilities, is 24 feet deep at lowest low water. A number of first-class anchorage berths are available in the outer harbor, but the holding ground is poor and the area is exposed to occasional heavy weather from the southwest. At Miike, the facilities provide five 350-foot berths for vessels drawing 20 feet and two 450-foot berths for vessels drawing 26 feet.

(a) Harbor. The port has 2 harbors: Ōmuta-ko, an improved section of Ōmuta-kawa in front of town; and Miike-ko, an artificial harbor at the south end of town (FIGURE VI - 23). A third waterway, the Suwa-gawa, is navigable only at high water; vessels drawing less than 6 feet can proceed as far as the first bridge. The shoreline on either side of town is bordered by a drying mud flat that extends from 1½ to 2 miles offshore. The landing facilities are approached through artificial channels across the mud flat. The 3-fathom contour lies from 300 to 900 yards beyond the zero tide line.

Ōmuta-kō, which has a general width of about 50 yards, has a low water depth of 2 feet in the river and in the channel across the mud flats. A basin about 150 yards long is located on the northern side at the inner end of the river section. Substantial

enlargements of the water area, including a basin on the southern side of the river were underway in 1937.

Miike-ko consists of an outer harbor, an inner harbor, and a wet dock. The outer harbor, which includes a portion of Shimabara-kaiwan, has lowest low water depths of 3½ to 8 fathoms. The inner harbor, which is enclosed by jetties, breakwaters, and seawalls, has an area of about 124 acres with lowest low water depths of 31 to 36 feet in the basin. The wet dock, which has a water area of about 32 acres, has its water level maintained at mean sea level by lock gates providing a depth of 28 feet. This depth is equivalent to 18.8 feet at lowest low water outside the dock.

1. ENTRANCE CHANNEL. Ōmuto-kō is approached through a channel, in which a depth of 2 feet at lowest low water is maintained, that leads across the drying mud flats off the mouth of Ōmuta-gawa.

The inner harbor at Miike-ko is approached through a dredged channel between 2 parallel jetties. It has a width of 450 feet between the jetties and 150 feet in the dredged area. It is about 1 mile long and has charted depths of 24 feet at lowest low water. The wet dock is entered from the inner harbor through a channel 120 feet wide, with a navigable width of 62 feet at the gate. There is a depth of 28 feet over the sill at lowest low water.

2. ANCHORAGE. Fifteen first-class berths are available for anchorage in the outer harbor in Shimabara-kaiwan in depths of 5¼ to 8 fathoms over mud, sand, and shell. The holding ground is seemingly poor and the area is exposed to occasional heavy weather from the southwest. When space is available, vessels can find a few berths for mooring or anchoring in the inner harbor or the wet dock where protection is had from all weather.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The tide is semidiurnal. The mean lunitidal interval is 8 hours 56 minutes. The spring tide rise is 16½ feet. Tidal currents at some distances off the entrances have a velocity of about 2 knots on both the flood and ebb. Near the entrance points of the jetties, currents sometimes reach a velocity of 5 knots, necessitating great care in entering or leaving the channel.

4. LOCAL WEATHER. Winds between southeast and southwest prevail during the summer in the vicinity of Ōmuta, and in the winter winds between the west and north predominate. Heavy seas are sometimes experienced with southwesterly winds but seldom at other times. The heaviest rainfall occurs in June and July. Although the visibility is often reduced by mist and fog it never becomes fully obscured.

(*b*) *Landing facilities.* The principal facilities are located at Miike-kō, but small vessels can berth in Ōmuta-kō.

The north side of Ōmuta-kō is improved by a seawall (Reference ①)* with a railroad track closely paralleling its face. The basin at the head of the harbor has a wharf (Reference ②) equipped with a coal conveyor and is directly connected with the mines by railroad.

The inner harbor in Miike-ko has a coaling quay (Reference ③), equipped with a bulk coal conveyor, for loading large vessels which are unable to enter the wet dock. A general cargo wharf was under construction on the northwest side in 1940. A mooring berth was available near some oil tanks on the southwest side of the basin, adjacent to the entrance.

The wet dock has a general cargo quay (Reference ④) that occupies the northwest side; a coaling quay (Reference ⑤) on the east side; and a general cargo wharf (Reference ⑥) on the southwest side (FIGURE VI - 24). The coaling quay (Reference ⑤) has 3 traveling coal loaders and a number of traveling cranes, one of which has a capacity of 15 tons (FIGURES VI - 25 and VI - 26). Railroad tracks serve this wharf. The general cargo wharf (Reference ⑥) has 2 sets of double tracks that dead-end at the face of the wharf (FIGURES VI - 27 and VI - 28).

Known details of wharf facilities are described in TABLE VI - 10.

Two floating cranes, with capacities of 3 to 15 tons, and a number of powerful tugs are based at the port.

(*c*) *Storage facilities.* Buildings on the northwestern and southwestern sides of the wet dock can probably be used for covered storage. Large areas for coal and coke dumps are adjacent to both basins. On the north side of Miike-ko is an area about 70 acres that is used for coal storage, while a small area of about 23 acres is used for coke storage. It is probable that a substantial portion of the reclaimed ground reported as being under construction on Omuta-kō also could be used for open bulk storage.

(*d*) *Capacity and clearance.* The unloading capacity of the port is estimated to be 1,200 short tons per day.

Communication is maintained by rail and steamer. The town and port are on the Kyūshū railroad network.

*References are encircled numbers on Figure VI - 23.

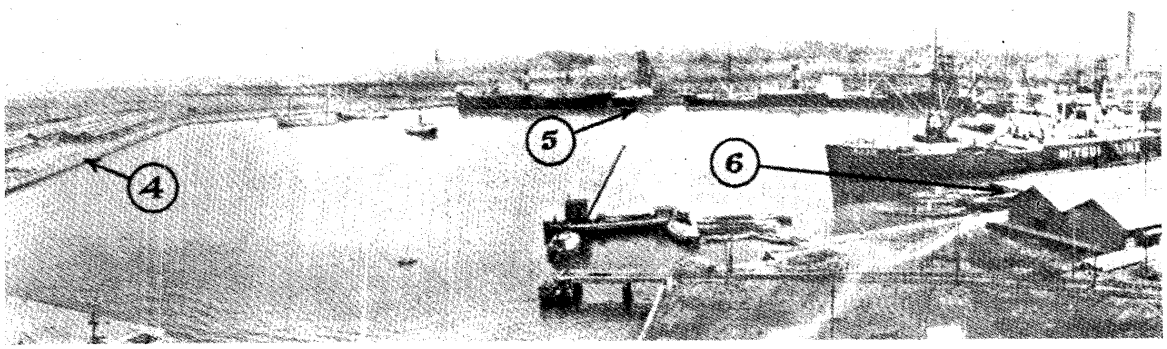

FIGURE VI - 24. *Ōmuta-Miike.*
Wet dock at Miike-ko, looking northeastward. Prior to 1933.

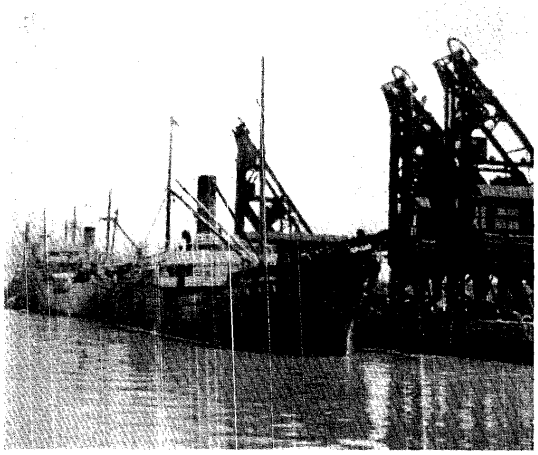

FIGURE VI - 25. *Ōmuta-Miike.*
Coaling quay (Reference ⑤), E side of wet dock at Miike-ko, looking northeastward.

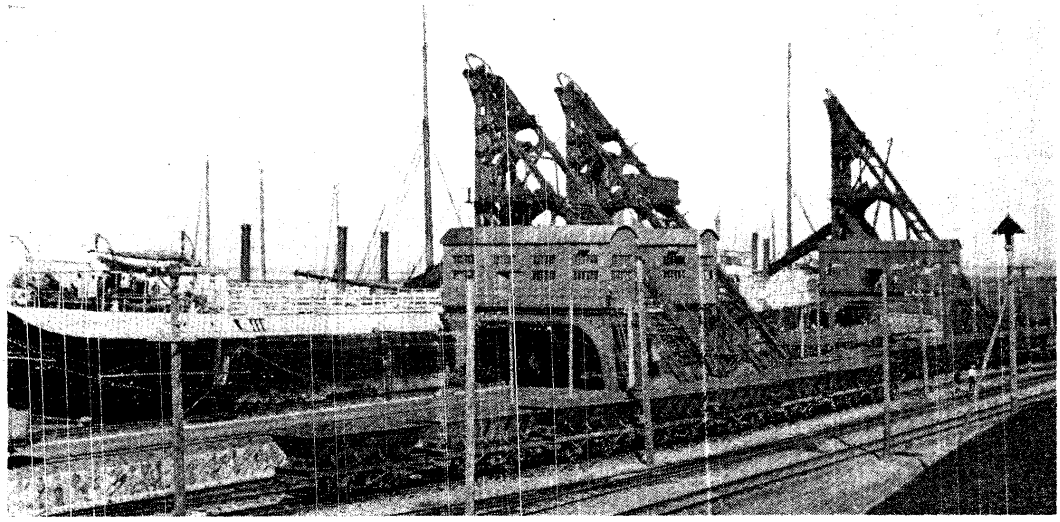

FIGURE VI - 26. *Ōmuta-Miike.*
Loaders on coaling quay (Reference ⑤), E side of wet dock at Miike-ko, looking northwestward. Prior 1926.

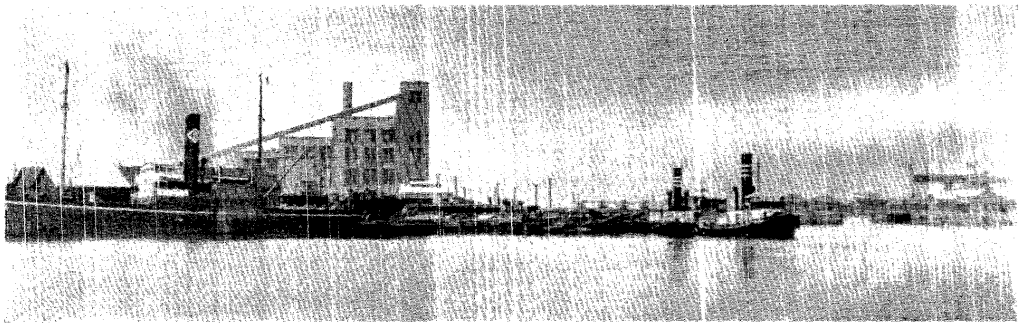

FIGURE VI - 27. *Ōmuta-Miike.*
Vessel anchored at cargo wharf (Reference ⑥), SW side of wet dock at Miike-ko, looking westward. Also shown is type of tugs available in harbor, power plant, and entrance to wet dock.

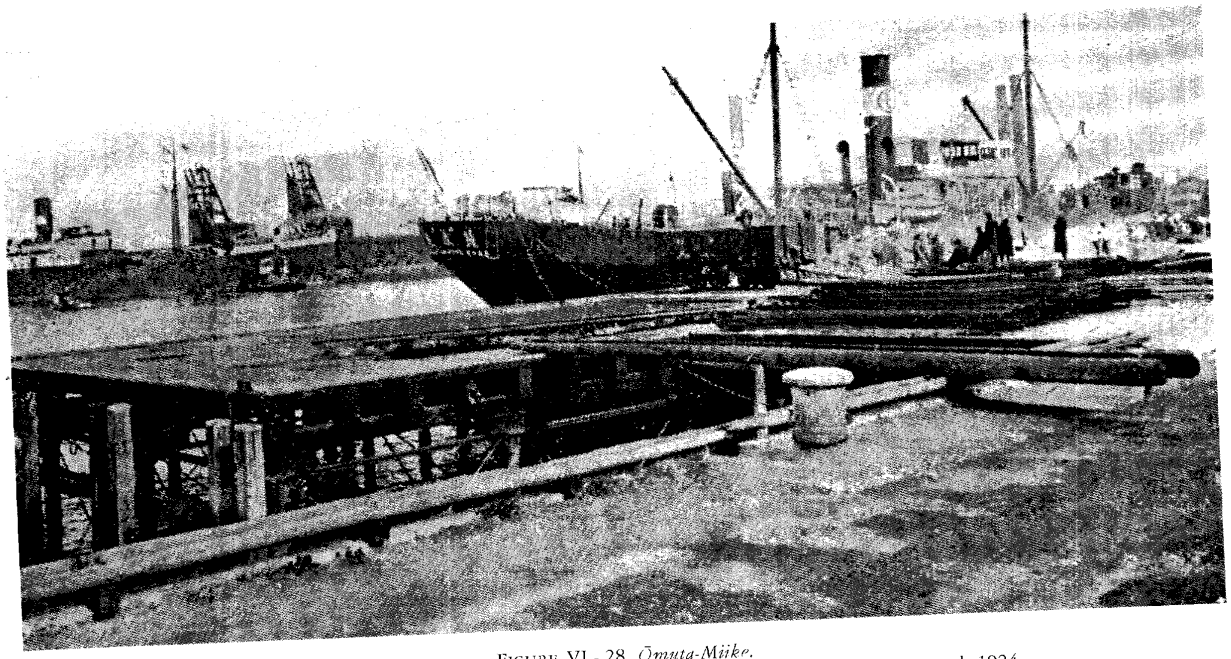

FIGURE VI - 28. *Ōmuta-Miike.*
Cargo wharf (Reference ⑥), SW side of wet docks at Miike-ko, looking northeastward. 1924.

TABLE VI - 10

PIERS, WHARVES, AND QUAYS AT ŌMUTA-MIIKE

Reference on FIGURE VI - 23	①	②
NAME	NO DATA	NO DATA
Location on waterfront	N side Ōmuta-ko	N side wet basin Ōmuta-ko
Purpose for which used	General cargo and bulk coal	Bulk coal loading
Type of construction	No data	No data
Description	Face (ft.)	Face (ft.)
Length	5,100	450
Depth of water	2	No data
Berthing space	5,100	450
Width of apron	Open	Open
Height above L. L. W.	No data	No data
Lighted or unlighted	No data	No data
Transit sheds	No data	No data
Mechanical handling facilities	No data	Coal conveyor from mine to vessels; size indefinite.
Railway connections	Track parallel to face of quay	Track at face of quay
Water supply	Water supplied by boat	Water supplied by boat
Electric current	No data	No data
Estimated terminal capacity		Coal storage area adjacent to quay
Remarks		

Reference FIGURE VI - 23	③	④
NAME	COALING QUAY	CARGO QUAY
Location on waterfront	E side, inner harbor, Miike-ko.	NW side, wet dock, Miike-ko.
Purpose for which used	Bulk coal	General cargo

TABLE VI - 10 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌMUTA-MIIKE

Type of construction	Quay wall, solid fill.	Masonry quay, solid fill.
Description	Face (ft.)	Face (ft.)
Length	300	900
Depth of water	34	28 (at m. s. l.)
Berthing space	300	900
Width of apron	Open	Open
Height above, M.S.L.	No data	12.3
Lighted or unlighted	No data	Lighted
Transit sheds	No data	No data
Mechanical handling facilities	Coal conveyor; capacity 400 tons per hour.	No data
Railway connections	Tracks to rear of wharf	Tracks near face of quay
Water supply	Water on quay; also delivered by boat.	Water on quay; also delivered by boat.
Electric current	No data	No data
Estimated terminal capacity	3,200 (coal)	840
Remarks	Coal storage area adjacent to quay. Berthage: one 350-ft. vessel drawing 20'.	Berthage: one 450-ft. vessel drawing 26'; one 350-ft. vessel, drawing 20'.

Reference FIGURE VI - 23	⑤	⑥		
NAME	COALING QUAY	CARGO WHARF		
Location on waterfront	E side, wet dock, Miike-ko.	SW side, wet dock, Miike-ko		
Purpose for which used	Bulk coal	General cargo		
Type of construction	Masonry quay wall, solid fill.	Wood deck on steel pilings		
Description	Face (ft.)	Face (ft.)	E side (ft.)	W side (ft.)
Length	1,380	300	75	75
Depth of water	28 (at m. s. l.)	28 (at m.s.l.)	28 (at m.s.l.)	28 (at m.s.l.)
Berthing space	1,380	300		
Width of apron	Open	Open		
Height above, M.S.L.	12.3	12.3	12.3	12.3
Lighted or unlighted	Lighted	Lighted	Lighted	Lighted
Transit sheds	No data	No data		
Mechanical handling facilities	3 Coal elevators, capacity 625 tons hourly; several traveling cranes, one of 15 tons.	None		
Railway connections	Track at face of quay; railroad yards adjacent.	2 Double tracks dead-end at face of wharf		
Water supply	Water on quay; also delivered by boat	Water on wharf; also delivered by boat.		
Electric current	No data	No data		
Estimated terminal capacity	5,000 (coal)	360		
Remarks	Coal storage area adjacent to quay. Berthage: one 450-ft. vessel drawing 26'; two 350-ft. vessels, drawing 20'.	Berthage: one 350-ft. vessel drawing 20'.		

(*e*) *Supplies.* Water is piped to the quays and can also be supplied by water boat. Water from the city of Ōmuta is delivered by hydrant at the coaling quays at the rate of 32 tons per hour, and on the general cargo wharf at 13 tons per hour. One tank vessel equipped with pumps, carries 150 tons of water.

Bunker coal is available in any quantity. Large mines of high grade coal are located within 2 miles of the docks, 1 mine being on the waterfront. The coaling quay of the inner harbor has a capacity of 400 tons per hour while the quay of the wet dock can deliver a total of 625 tons per hour.

There is a work shop near the general cargo wharf where minor repairs can be made.

(7) Misumi (32° 37′ N, 130° 27′ E).

Misumi is at the extremity of Oto-hanto on the west coast of Kyūshū, southward of Ōmuta-Miike. The town is opposite the north end of the harbor; the railroad station and port facilities are about 1½ miles south of town between Sagari-matsu and the town of Kiwazaki on the south shore of Odo-hanto. The port is a shipping point for cement and lumber. One cargo wharf has a 984-foot face in 24 to 48 feet of water. Other facilities have shallow depths alongside, but plans for considerable port development have been proposed.

(a) Harbor. Misumi-kō lies between Ōyano-shima on the western side; Odo-hantō, and Tobase-jima on the eastern side and Senzoku-shima on the southern side (FIGURE VI - 29).

From its northern limit the harbor, with a least width of 500 yards, extends southeastward for about 1,600 yards to Ushikorobi-hana; then, with a least width of 300 yards, it extends southwestward to Sagari-matsu; and then, over a width of 1 to 1½ miles, extends about 1½ miles to Senzoku-Zoza-jima. The shoreline of the constricted part of the strait has a number of narrow, fringing shoals that drop off steeply at the 3-fathom contour. The wider part of the harbor has an irregular shoreline that is generally bordered by broad drying shoals and reefs and cluttered in places by small islands and shoals. Depths in all fairways are from 7 to 17 fathoms with no hidden dangers. An overhead power cable, 140 feet above high water, crosses the fairway south of Ushikorobi Hana. Shelter is offered from all weather in Misumi-ko but southwesterly winds sometimes cause trouble in the handling of cargo.

Noboritake-ko, on the western shore near the anchorage, is about 250 yards wide at its mouth between Ki-shima and Kan Zaki, and extends 750 yards westward and southwestward to the 1-fathom contour. The shoreline of the recession is bordered by drying reefs and shoals. In the southwest corner, over a narrow strip, between the 2 parts of the town of Noboritate, the bottom rises gradually for about 250 yards to the zero tide line and then 200 yards farther to an improved shoreline. Depths in the harbor range from 1 to 6 fathoms.

1. ENTRANCE CHANNEL. The northern entrance, Misumino-seto, leading from Shimabara-kaiwan, is divided into 2 channels by Nakagami-shima. The eastern channel, Ko-seto, used only by small craft, is foul over most of its width and has a 1½-fathom controlling depth in a restricted fairway between drying reefs and shoals. The western channel, Ō-seto, about 120 yards wide outside the 3-fathom contour, has central depths of 10 to 19 fathoms. Iwaya-ura, which opens off the fairway opposite Misumi immediately outside the harbor limit, is a recession in the shoreline about 120 yards wide at its mouth and about 160 yards long outside the 3-fathom contour. From this point the bottom rises gradually for 200 yards to the zero tide line and then for 100 yards to an improved shoreline.

The southern entrance, leading from Yatsoshiro-wan, is divided into 2 main channels by Senzoku-Zōzō-jima. The eastern channel, Zōzōno-seto, about 1,600 yards long, has a least width of 240 yards outside the 3-fathom contour, and central depths of 9 to 15 fathoms. A shoal extends southwestward 250 yards from Kata-shima near the south end of the fairway; otherwise there are no hidden dangers. The shoals that border the beaches generally drop off steeply to deep water. The western channel of the south entrance, with a controlling depth of 3¼ fathoms, has a tortuous fairway among islands, reefs, and shoals, and is not recommended for passage.

The eastern entrance, Motareno-seto, extends about 2½ miles between Odo-hantō and Tobase-jima. It has a general width of about 300 yards outside the 1-fathom contour with general depths of 1½ to 2½ fathoms and a controlling depth of 1¼ fathoms.

2. ANCHORAGE. Outside the buoyed area there are 2 first-class and 2 third-class berths for anchorage in depths of 5½ to 11 fathoms, over mud and sand. The holding ground is good. Limited anchorage is available off the town of Misumi but currents are strong and the holding ground poor. The area is not recommended. Small craft are afforded safe anchorage in Iwaya-ura in depths of ½ to 3 fathoms. Temporary fair weather anchorage can be had between the 10- and 16-fathom contours at distances of 1,300 to 4,500 yards north-northeasterly from Nakagami-shima.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The tide is semidiurnal. The mean lunitidal interval for Misumi-kō is 8 hours, 46 minutes with a spring high water rise of 13.0 feet. Currents flow northward during flood and southward during ebb tide, with slack water occurring about the time of high and low tide. Flood currents average 2½ knots in the north entrance channel; 1¼ to 1¾ in the harbor; and 2 knots in the south entrance channel. Ebb currents are 3½ and 2½ knots, respectively, with extreme velocities of 6 knots having been recorded in the north entrance and 5 knots in the south entrance.

(b) Landing facilities. Quays, piers, and warehouses have recently been constructed in the vicinity of Sagari Matsu and there are 2 floating landing stages in 1½ fathoms of water abreast the Misumi railroad station. Plans for considerable port development have been proposed.

There were 5 mooring buoys on a spacing of about 300 yards that extend in a northeasterly direction from a position about ⅜ mile west-northwestward of Shiro-se to a point southeastward of the Misumi railroad station. Two of the buoys were in depths of 5½ fathoms or more.

Known details of wharf facilities are described in TABLE VI - 11.

A stone embankment fronts the shore at Misumi with nearby depths of 3 fathoms. The waterfronts of Noboritate and Iwaya and those of a number of smaller places are improved but they have no water at low tide.

Lighters are available for the transfer of cargo between ship and shore.

(c) Storage facilities. There are 9 or 10 warehouses at Misumi.

(d) Capacity and clearance. The unloading capacity of the port is estimated to be 960 short tons per day. Misumi is on a branch railroad and road which connect with the island systems. Steamers called.

(e) Supplies. Water can be taken on from water boats.

(8) Kagoshima (31° 35′ N, 130° 34′ E).

Kagoshima is on the western side of the bay, Nishi-suidō, westward of Sakura-shima in the southern part of Kyūshū. It is on the western side of Kagoshima-wan, a gulf that enters the southern coast of Kyūshū Island.

(a) Harbor. Kagoshima-kō consists of an outer harbor and an inner harbor (FIGURE VI - 30). The outer harbor is the area in Nishi-suidō, outside the breakwaters which inclose the artificial inner harbor.

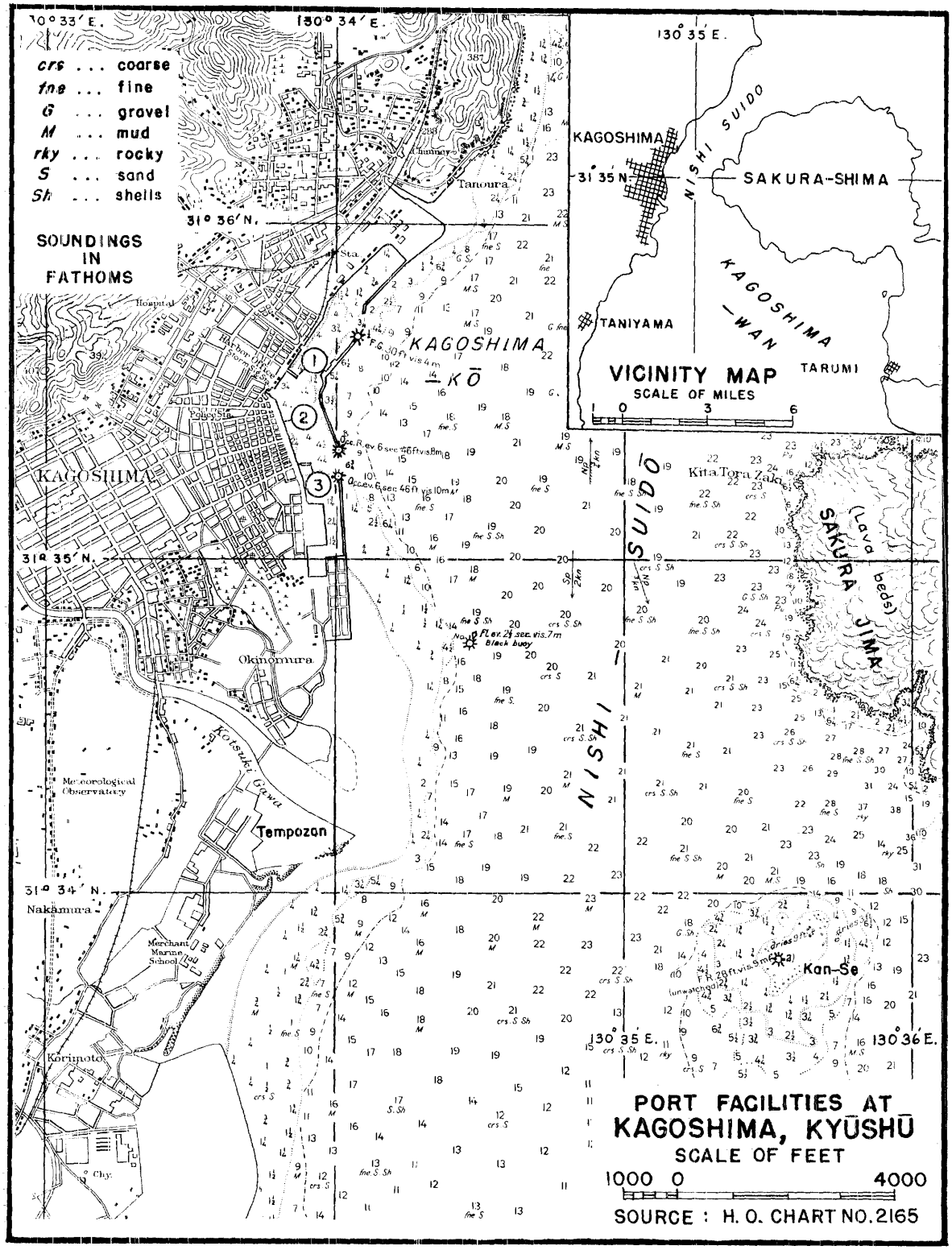

FIGURE VI - 30. *Kagoshima.*
Map of harbor showing location of port facilities by encircled reference numbers.

TABLE VI - 11

PIERS, WHARVES, AND QUAYS AT MISUMI

Reference on FIGURE VI - 29	①	②			③		
LOCATION	KASSEN-SAKI	IN FRONT OF RAILROAD STATION			IN FRONT OF RAILROAD STATION		
Purpose for which used	Cargo wharf	Boat landing			Boat landing		
Type of construction	No data	No data			No data		
Dimensions	Face (ft.)	Face (ft.)	W side (ft.)	E side (ft.)	Face (ft.)	W side (ft.)	E side (ft.)
Length	984	30	150	150	30	150	150
Depth of water	24 to 48	9	3 to 9	3 to 9	9	3 to 9	3 to 9
Berthing space	984	30	150	150	30	150	150
Width of apron	Open	Open			Open		
Transit sheds	No data	No data			No data		
Mechanical handling facilities	No data	No data			No data		
Railway connections	Track parallel with and 240′ from face of quay	Track within 300′ of landing			Track within 300′ of landing		
Water supply	Water available by boat	Water available by boat			Water available by boat		
Electric current	No data	No data			No data		
Estimated terminal capacity	960	—			—		
Remarks	Berthage: two 450-ft. vessels drawing 20′.						

The outer harbor is narrowed to a minimum navigable width of 1 mile by the lava bed extending off the western side of the island, Sakura-shima. It has general depths of 10 to 25 fathoms and is free of detached dangers, but the shores northward and southward of the breakwaters are bordered by foul ground extending about 700 yards offshore in places.

The inner harbor is separated from the outer harbor by 3 breakwaters, extending in a north—south direction. There are general depths of about 3 to 4¾ fathoms in the middle, but in the northern and southern ends, as well as along the detached breakwater, the depths are only ½ to 1¾ fathoms. There is a basin with depths of 10 feet in the southern part of the inner harbor. There are piers, a quay, a small basin, and a retaining wall along the western side of the inner harbor; a lumber yard occupies the northern part.

1. ENTRANCE CHANNEL. The least navigable width in the main channel in the outer harbor is about 1,760 yards between Kan-se and Tempozan, with depths of 15 to 23 fathoms.

The entrances to the inner harbor are 2 narrow passages at either end of the detached breakwater; the principal entrance, the southern one, has depths of 5 to 6 fathoms.

2. ANCHORAGE. In the outer harbor the bottom is mostly sand and the depths are ample for large vessels. Large vessels can anchor in about 13 fathoms, over mud and sand, with the light structure on the southern end of the detached breakwater bearing about 251°, distant about 550 yards. Small vessels can anchor about 400 yards farther westward in depths of less than 11 fathoms, but caution is necessary at this position for a strong westerly wind might cause a vessel to drag into deep water. The anchorage off Kagoshima is classed as a typhoon anchorage for large vessels.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water interval at Kagoshima is 7 hours, 09 minutes; the mean range is 5.3 feet; and the spring range is 7.7 feet. Tidal currents reach a maximum rate of about 2 knots between the breakwaters and Sakura-shima.

4. LOCAL WEATHER. The prevailing winds are southeasterly from April to September; between October and March they are from opposite direction. In general, the winter northwesterly winds have the greatest force, especially in January. July winds are weakest; the most violent storms occur in early autumn. During the winter, vessels may experience some difficulty in handling cargo in the outer harbor.

(*b*) *Landing facilities.* The most important landings include a quay and 2 floating piers located along the western side of the inner harbor. The quay (Reference ②)*, with a depth of 24 feet alongside, is along the western end of the inner harbor. No. 1 Pier (Reference ①), consisting of 2 steel and concrete floats, is located north of the quay and opposite the fort on the detached breakwater. No. 2 Pier (Reference ③), of similar construction, is located opposite the southern entrance to the inner harbor.

Large vessels handle cargo from the anchorage. Lighters are available for this purpose. Winds disrupt harbor operations about 50 days each year.

Harbor improvements, contemplated in 1931, included widening and deepening the inner harbor, and the construction of a new quay to provide berthing space for 6 ships at the same time. The present status of this work is not known.

(*c*) *Storage facilities.* There are several one-story storehouses along the quay wall. The port has a total of 80 storehouses. Open storage yards are available.

(*d*) *Capacity and clearance.* A railroad extends along the coast. Spurs serve the northern part of the inner harbor. Highways parallel the railways and roads lead to the interior. Kagoshima is a port of call for Japanese merchant vessels. (FIGURE VIII - 95).*

*Town plan of Kagoshima, Chapter VIII.

*References are the encircled numbers on Figure VI - 30.

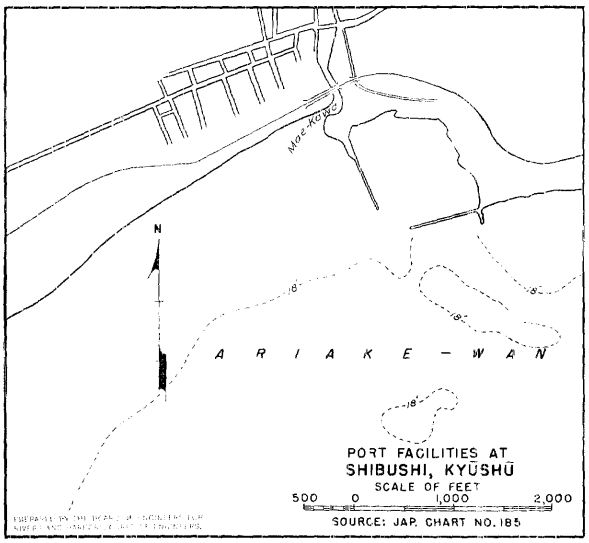

FIGURE VI - 31. *Shibushi.*
Sketch of harbor.

(*e*) *Supplies.* Water is laid on the quay (Reference ②), or can be delivered to vessels at the anchorage.

Two or three bulk oil concerns are located at the port. Oil is piped to the waterfront by at least 1 company.

(*f*) *Repair facilities.* A repair yard for small vessels is located on the reclaimed land in the southern part of the inner harbor, near the root of the southern breakwater. There is a marine railway 262 feet long at the repair yard.

B. Secondary ports.

(*1*) ***Shibushi*** (31° 28′ N, 131° 06′ E).

Shibushi is an artificial harbor near the southeast extremity of Kyūshū Island at the head of a bay, Ariake-wan.

(*a*) *Harbor.* The small harbor is east of the mouth of Mae-kawa, a river at the head of Ariake-wan (FIGURES VI - 31 and VI - 32). Its basin has dredged depths from 4 to 15 feet and is protected on its western and southern sides by breakwaters. The town is north of the harbor.

Ariake-wan has been used as a naval anchorage; it forms an outer anchorage, in depths of 10 fathoms or more, about 2 miles from the harbor of Shibushi. Swells frequently run into the bay and vessels may not ride easily at the anchorage.

(*b*) *Landing facilities.* Harbor works completed in 1943 include some quayage; lengths and depths alongside are not known. A railway and highway serve the port and town.

(*2*) ***Aburatsu*** (31° 34′ N, 131° 25′ E).

Aburatsu is on the east coast of Kyūshū near its southern extremity. In addition to being the headquarters of a deep-sea fishing fleet, it is a port of shipment for timber which is floated out through Hori-kawa, a river flowing into the western corner of the harbor.

(*a*) *Harbor.* Aburatsu-kō is on the western side of a narrow peninsula which terminates in Obuse-hana. Aburatsu is at the head of the harbor.

The harbor is about 1 mile northward of I-saki; its limit is established by a line drawn between Obuse-hana and Nagasaki-bana (FIGURE VI - 33). It is approached from the eastward between Jako-se, a rock awash, situated about 1,000 yards south-southeastward of Obuse-hana, and a number of rocky shoals and islets which extend in a southerly direction from a position about 800 yards southward of Jako-se.

Depths in the entrance are about 15 fathoms. Toward the middle part of the harbor within the outer breakwater, depths are from 3½ to 4½ fathoms. The 3-fathom curve lies about 500 yards offshore at the head of the harbor.

A breakwater extends southeastward from Matsuga-bana on the western part of the harbor. An outer breakwater is on the western side of Obuse-hana.

Anchorage can be had in a depth of 3½ fathoms, over sand, with the outer breakwater light bearing 162°, distant about 325 yards. Vessels of deep draft can anchor in depths from 6½ to 9 fathoms, either between Obuse-hana and I-saki, or between the latter point and the northern extremity of O-shima. The exposed anchorages are not safe when a heavy swell runs in with easterly winds.

Tidal currents in the approaches to Aburatsu-kō set in a northerly and opposite direction, with a velocity of about ½ knot. It is reported that the directions are sometimes influenced by the wind.

Tides for the area (Hato-hana in inner harbor) are: high water full and change, 5 hours 58 minutes; springs rise 6¼ feet; neaps 5 feet; and neap range 2¼ feet.

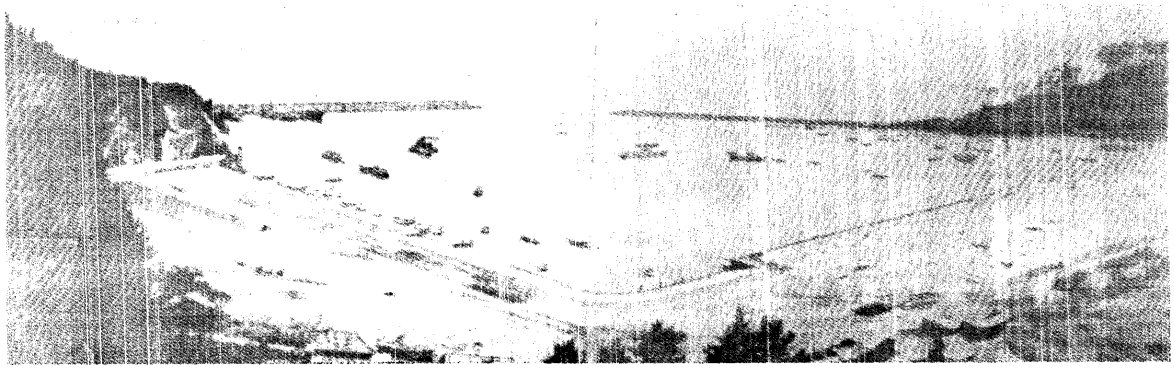

FIGURE VI - 32. *Shibushi.*
Basin, looking southwestward, showing small inner harbor protected by breakwaters.

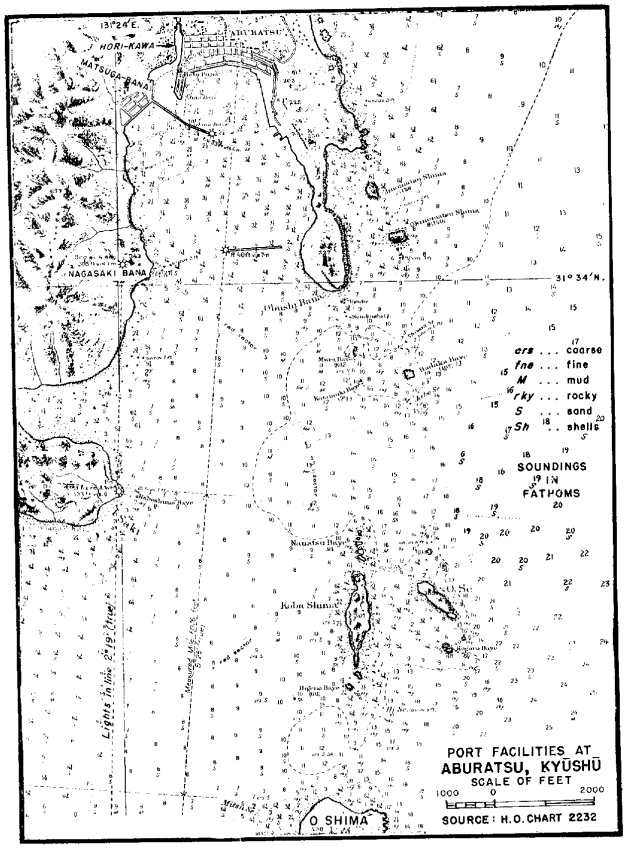

FIGURE VI - 33. *Aburatsu.*
Map of harbor.

(*b*) *Landing facilities.* There is a mole at the eastern side of the river mouth at the head of the harbor. This mole appears to be about 200 feet wide and about 600 feet long. Charts indicate 2 rows of buildings on this wharf. Dredging was in progress in 1940 along the northern part of the harbor and on all sides of the mole, but the project depths are not known.

Along the northern shore eastward of the wharf is a quay, about 1,300 feet long, equipped with landing stages. Two small piers are shown near the center of the harbor on the eastern side.

The town is connected with the Japanese railway system. The port is served by highways extending along the coast and into the interior of the island.

(*c*) *Supplies.* Aburatsu-machi has a municipal water works, and it is reported that reasonable amounts of water are available to vessels. Fuel oil can be supplied to vessels from 8 tank boats equipped with pumps; the maximum fueling capacity is about 5 tons per hour.

(3) Hososhima (32° 26′ N, 131° 40′ E).

Hososhima is on the eastern coast of Kyūshū a few miles eastward of Tomitaka. In addition to reported recent harbor improvements, which include several piers, the southern waterfront of the harbor appears to be faced or quayed for a total length of 3,055 feet in depths from 12 to 25 feet.

(*a*) *Harbor.* Hosojima-ko, a natural harbor, has an inner and outer harbor (FIGURE VI - 34). In the northern approach to the inlet, about 700 yards eastward of the eastern extremity of Maki-shima, there is a bank with a least depth of 6 fathoms. Islets and rocks lie off the eastern extremity of the southern peninsula. The eastern and northern sides of this islet are fringed with shoals within about 200 yards.

The entrance to the outer harbor between the points, Hososhima-saka and Matsuga-bana, is about 510 yards wide between the 5-fathom contour and has charted depths of 11 fathoms in the fairway. The roughly inverted dome-shaped harbor is about 1,250 yards long, with a maximum width of 650 yards between the 5-fathom contour decreasing to about 200 yards at the entrance to the inner harbor. Charted depths range from 6½ to 8 fathoms. Within both the inner and outer harbors there are no charted dangers off the shore banks; in the outer harbor the 5-fathom contour lies fairly close inshore.

The entrance to the inner harbor at Bansho-hana is about 200 yards wide between the 5-fathom contour; charted depths are 5½ fathoms in mid-channel. It is about 1,300 yards long and has a general width of about 400 yards. The depths in its principal area, the southeastern half, range from 3½ to 4¾ fathoms.

Anchorage can be had about 500 yards within the entrance to the outer harbor, in about 8 fathoms, sand and shell bottom, but during strong northeasterly winds this position is made unsafe by a heavy swell. The outer harbor affords 1 first-class and 1 second-class anchorage berth.

Small vessels can anchor within the inner harbor in depths from 2¾ to 4½ fathoms, sand and mud bottom. This inner harbor is somewhat sheltered from onshore winds by Bansho-hana, the southern side of the entrance to the inner harbor. However, in winter it is not safe during westerly winds, which may reach gale force.

Anchorage has been obtained outside Hososhima-kō, with the light on the southern peninsula bearing 217°, distant about 1 mile in depths of 18 fathoms, fine sand bottom. This position was found to be sheltered from winds between west and north, but it became unsuitable during a heavy swell raised by a typhoon in the vicinity of Okinawa-gunto.

The lunitidal high water mean interval of Hososhima-kō is 6 hours, 05 minutes; the high water springs rise 6½ feet, high water neaps 5 feet, and the mean tide level 3.9 feet. Seiches, with uniform periods of about 10 minutes, occur within Hososhima-kō. The rise and fall may be about 8 inches during calm weather, and about 2 feet during storms.

In the vicinity of Hososhima-kō, the prevailing winds are southerly in the spring and summer, northerly in autumn, and westerly in winter. Typhoons may occur from August to October, but during the first 7 months of the year there is usually calm weather.

(*b*) *Landing facilities.* Harbor improvements at Hososhima, begun in 1932, were in process of completion in 1941. The parts already completed on the southern side of the inner harbor, include a reclaimed land embankment, quay, and floating pier with dredged areas which permit 2 vessels of around 2,000 tons to come alongside.

However, the chart shows 2 offshore piers in the inner harbor, on the southern side; the eastern one, about 325 feet long, has charted depths of 21 to 28 feet; the western one, about 250 feet long, has minimum charted depths of 17 feet. The entire southern waterfront, which is stepped and not in a straight line, appears to be faced or quayed for a total length of 3,055 feet

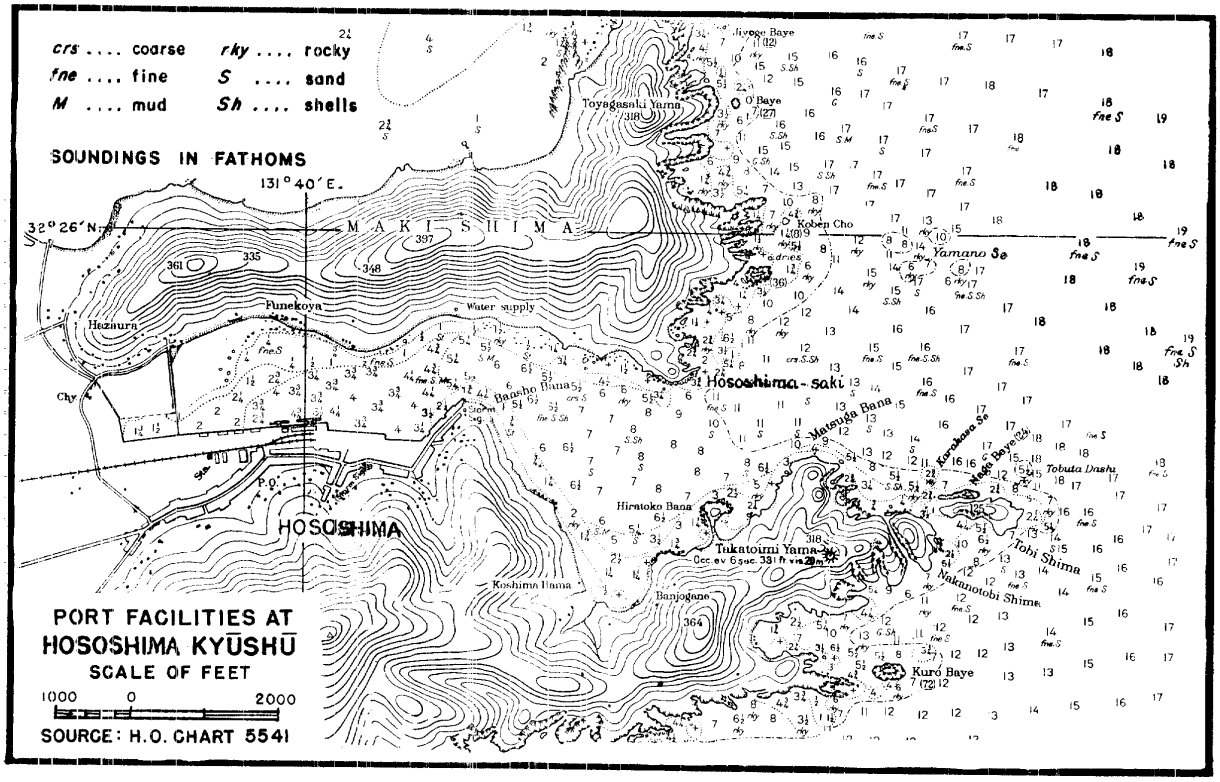

FIGURE VI - 34. *Hososhima.*
Map of harbor.

with depths from 12 to 25 feet. The lengths and depths of these sections of retaining walls or quays (east – west) progressing westward from Bansho-hana are as follows:

150 feet long and about 12 feet deep.
165 feet long, 15 feet deep.
250 feet long, 15 to 19 feet deep.
80 feet long, 19 feet deep.
460 feet long with a step on the western end 60 feet long, 19 to 24 feet deep.
750 feet long with a step on the western end 115 feet long, 22 to 25 feet deep.
1,200 feet long (westward of the offshore piers), 12 to 16 feet deep.

(*c*) *Clearance facilities.* Hososhima is connected with the Japanese railroad system.

(*d*) *Supplies.* Water could be supplied to vessels by 2 tank boats, equipped with pumps, of about 10 tons capacity each.

(4) Totoro (32° 30′ N, 131° 41′ E).

Totoro is on the center of the east coast of Kyūshū Island. The town lies on the southwestern side of the harbor, west of Kurakake-misaki. The port has a small partially sheltered anchorage and a protected shallow harbor, the headquarters of a fishing fleet.

(*a*) *Harbor.* Totoro-kō is open to northeastward; the approach and entrance are obstructed by rocky shoals and Shakunose, a large reef (FIGURE VI - 35). The entrance is about 1,300 yards wide, but the bay is divided into eastern and western sections by a long and irregular point projecting northward from the head of the bay.

The western inlet recedes nearly ¾ mile to the town of Totoro with a general width of about 500 yards. Depths approaching the entrance are 3 to 10 fathoms with only 1½ fathoms at the beach in front of the town.

In the eastern inlet there are clear depths of 3¼ to 4 fathoms to the village of Akamizu, midway on the eastern side.

The fishing fleet which uses the harbor as a base of operation usually causes heavy traffic. The shoal depths do not afford anchorage to large vessels. Outside the entrance points and partially protected by the reefs, space could be found for 3 second-class and 8 third-class anchorage berths.

Lunitidal interval of mean high water at Totoro is 6 hours, 5 minutes. High water springs rise 6.5 feet, neaps 5 feet, and the mean tide level is 3.9 feet above lowest low water.

(*b*) *Landing facilities.* Fronting Totoro is a municipal pier, about 59 feet long, with depths of 12 feet at its outer end.

In the middle of the southern shore there is a basin or camber protected by a breakwater. It has depths of 10 to 4 feet.

At Akamizu village, on the eastern inlet, there is a quay, about 225 feet long, with depths of 19½ feet alongside. It is connected to Totoro by a road.

(*c*) *Clearance facilities.* The town is served by the coastal railroad.

(5) Tsukumi (33° 04′ N, 131° 52′ E).

Tsukumi (Tukumi) is on the northeast coast of Kyūshū on the western side of the bay, Bungo-suido at the head of the

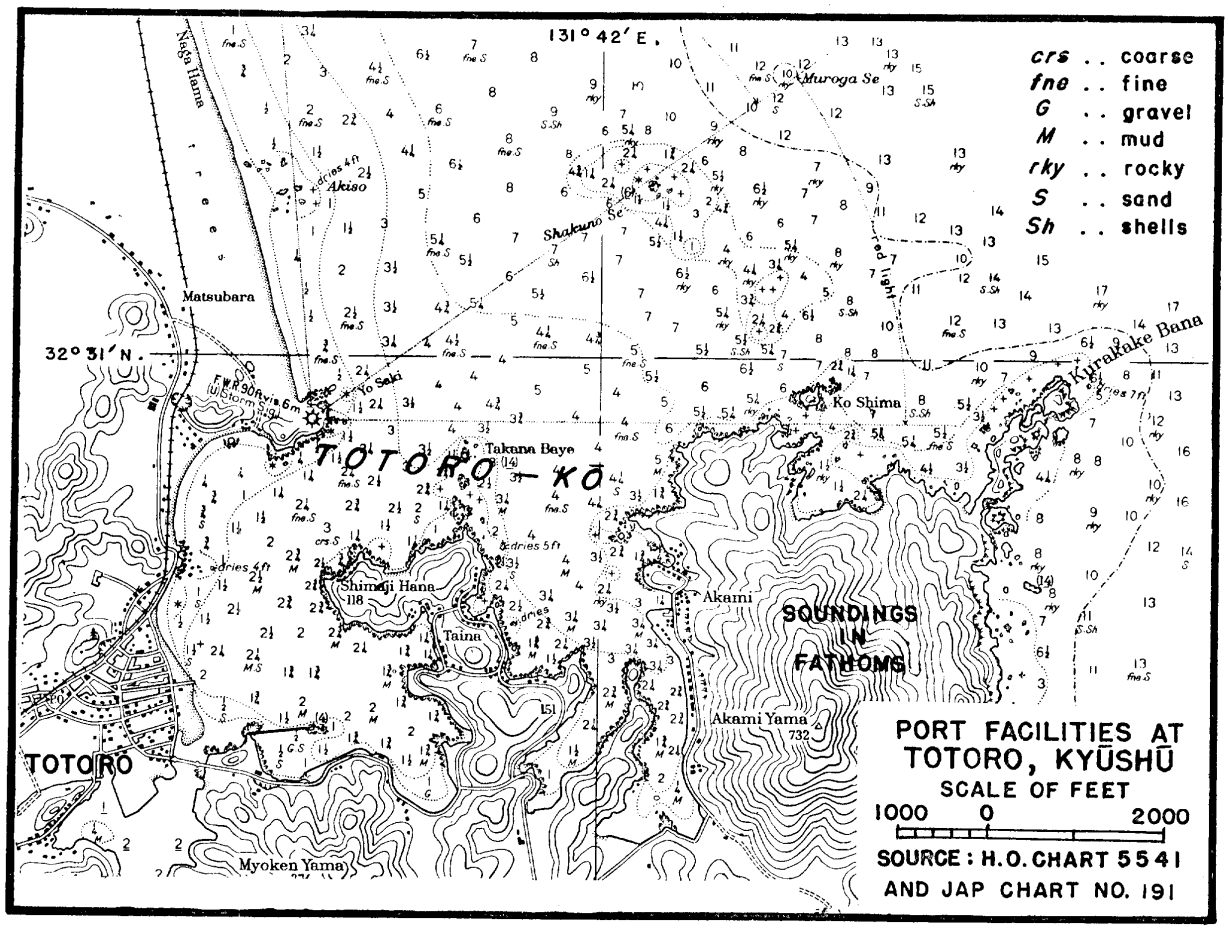

FIGURE VI - 35. *Totoro.*
Map of harbor.

gulf, Tsukumi-wan. A port for shipment of cement, it has a partially sheltered anchorage and a quay with 31 feet of water alongside.

(*a*) *Harbor.* Tsukumi-wan is open to the northeastward and indents the coast about 4 miles (FIGURE VI - 36). The entrance is between the points, Kusuya-saki and Kannon-saki. Tsukumi-kō, at the head of the bay, is divided into northern and southern sections by No-shima, an islet close off a point at the middle of the head.

The river Aoe-kawa flows into the western side of the harbor just southward of this point. Aoe village is on its northern bank and Tsukumi-machi is on the southwestern side of the southern section of the harbor. Tokuura village is on the northern section of the harbor and Kataura village is on the northern side of the same section.

Depths in the entrance to Tsukumi-wan are 19 to 29 fathoms, decreasing to 13 fathoms in Tsukumi-kō. Approach to the quay in the northern section of the harbor is in 5 to 10 fathoms. Depths in the northern section are 6½ to 11 fathoms. The inlet formed on the western side of Chinu-saki has 10 fathoms in the entrance, decreasing gradually to 5 fathoms at the head.

Vessels anchor in depths of 6½ to 11 fathoms, over mud, either southward of No-shima or off Tokuura. Southward of the eastern end of No-shima, in depths of about 11 fathoms, the sea is usually smooth and it is reported that wind and sea very seldom interfere with working of cargo.

Twenty-four first-class, 3 second-class, and 6 third-class anchorage berths may be found in Tsukumi-kō, westward of Chinu-saki and Kuro-shima.

The mean high water interval is 7 hours, 38 minutes. Spring tides rise 6.2 feet, neap tides rise 4.9 feet. Mean level above Indian Spring low water is 3.9 feet.

(*b*) *Landing facilities.* Both northern and southern sections of the harbor have harbor improvements along almost the entire waterfront. Many small piers, river mouths, and enclosed small boat basins break the shoreline.

At Tokuura on the southwestern side of the northern section, a quay used for the shipment of cement is reported able to accommodate a 3,000-ton vessel.

There are other wharf facilities at Tokuura as well as at Tsukumi. However, no data regarding such facilities are available.

(*c*) *Supplies.* Water could be supplied to vessels from waterboats.

(6) Ōita (33° 14′ N, 131° 35′ E).

Ōita is in the southwestern part of Beppu-wan, a bay on the northeastern coast of Kyūshū Island. The bay, which can pro-

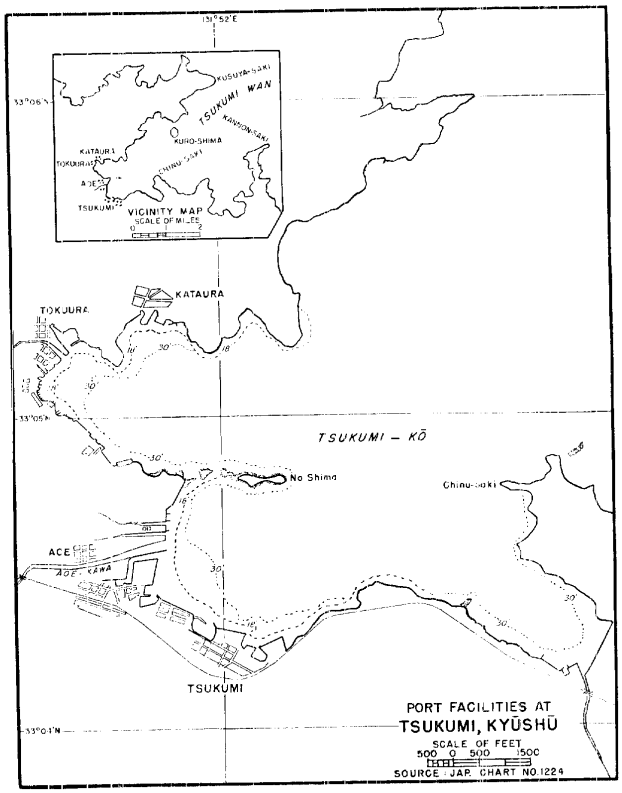

FIGURE VI - 36. *Tsukumi.*
Sketch of harbor.

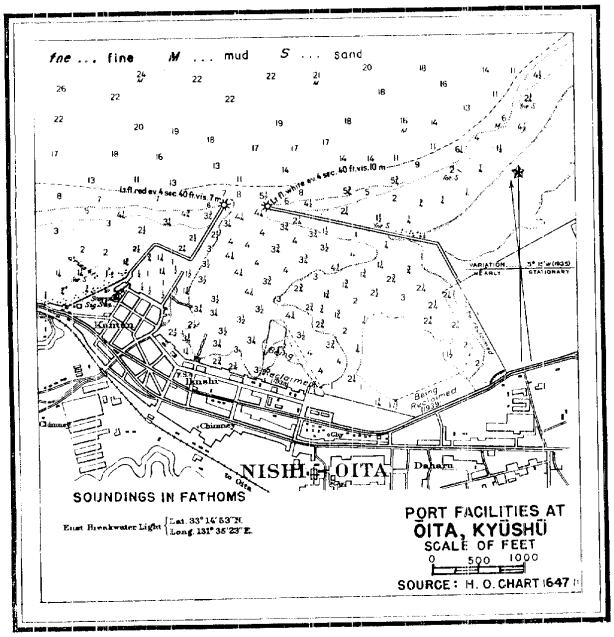

FIGURE VI - 37. *Ōita.*
Map of harbor.

vide 170 first-class anchorage berths, has 2 secondary ports, Ōita and Beppu, connected by an electric railway. The Japanese Navy has used the bay for anchorage. Minor landing facilities at Ōita have 18 to 20 feet of water alongside.

(*a*) *Harbor.* The entrance to the harbor, between the ends of the 2 breakwaters, is 150 yards wide; and between the 3-fathom contour, about 110 yards wide (FIGURE VI - 37). Immediately outside the entrance there are depths of 48 feet, decreasing to 26 feet just inside.

The 140-acre eastern part of the harbor is roughly rectangular in shape, about 1,000 yards long and 625 yards wide, and has depths of 18 feet, decreasing to zero in the southeastern part; this latter part of the harbor was being dredged in 1939. The western part of the harbor has depths of 16 to 25 feet. A floating wharf, a pier and 2 small landings are located in the southwestern part of the harbor. Harbor improvements in progress include land reclamation, dredging, and the construction of quays.

A boat basin in the western end of the harbor is formed by another breakwater, within the harbor, extending north-northeastward, normal to the shore. This 5½-acre basin is about 180 yards by 150 yards, and has an entrance about 45 yards wide, with depths of 9 feet. Depths within the basin range from 3 to 8 feet.

At Ōita, the 5-fathom contour passes through the ends of the breakwaters, and the 10-fathom contour lies about 75 yards off the ends. The northern half of Beppu-wan, where the depths are less than 30 fathoms, affords anchorage for about 170 first-class berths.

At Ōita the mean high water lunitidal interval is 8 hours 19 minutes; the mean high water of springs is 7¼ feet above lowest low water; the mean high water of neaps 5½ feet; and the mean tide level 4¼ feet.

(*b*) *Landing facilities.* The floating pontoon wharf on the south shore of the harbor, opposite the entrance, is about 240 feet long, with depths of 18 to 20 feet alongside. The pier on the eastern side of the inner breakwater is about 325 feet long, with a depth of about 19 feet at its end. The 2 small landings, south of the pier, each about 40 feet long, dry during low water. There is some quayage on the south side of the harbor with depths of about 7 to 15 feet, but detailed data are not available.

(*c*) *Clearance facilities.* Steamers of several Japanese companies call here. The port is connected with the Hibun railway line, and an electric line runs between Ōita and Beppu.

(*d*) *Supplies.* Fresh water is available only in small quantities.

(*e*) *Repair facilities.* Repairs might be made at a small shipbuilding yard.

(*7*) ***Beppu*** (33° 16′ N, 131° 31′ E).

Beppu, the second of 2 ports on the bay, is in the southwestern part of Beppu-wan, on the northeastern coast of Kyushu.

(*a*) *Harbor.* An artificial basin-harbor is formed by a pier on the southern side and a breakwater on the northern and eastern sides (FIGURES VI - 38 and VI - 39). The entrance to the harbor, facing southward, between the ends of the breakwater and pier, is about 50 yards wide, with a depth of 5 feet.

The 4.6-acre harbor is about 140 yards by 160 yards, and has depths ranging from 3 to 13 feet. There are 2 concrete mooring piles southward of the pier. The waterfront southward of the harbor is reported as being reclaimed. The 5-fathom contour lies

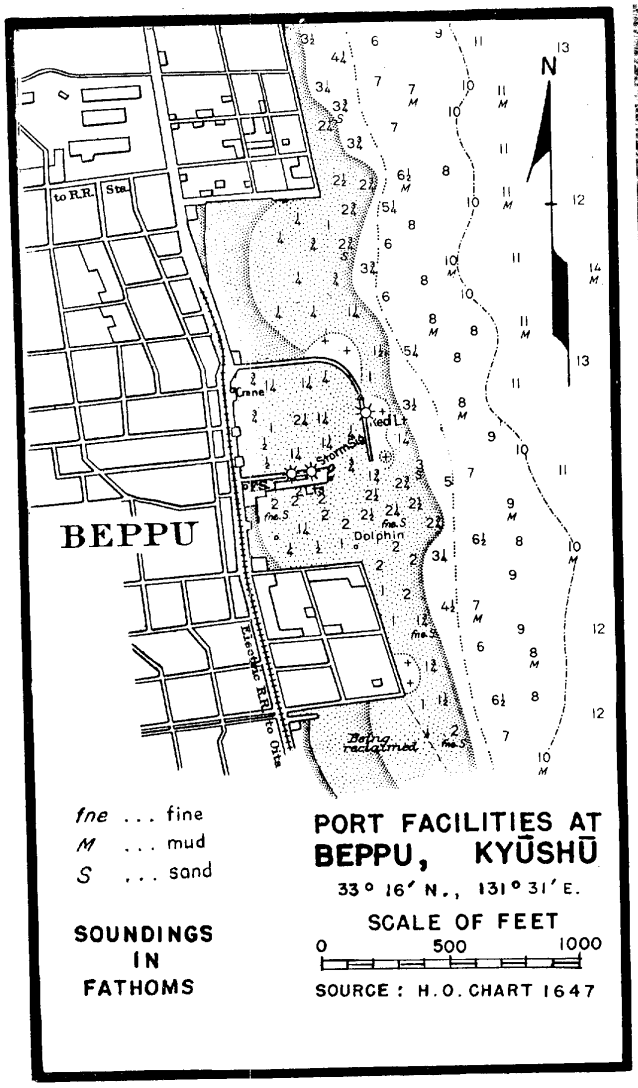

FIGURE VI - 38. *Beppu.*
Map of harbor.

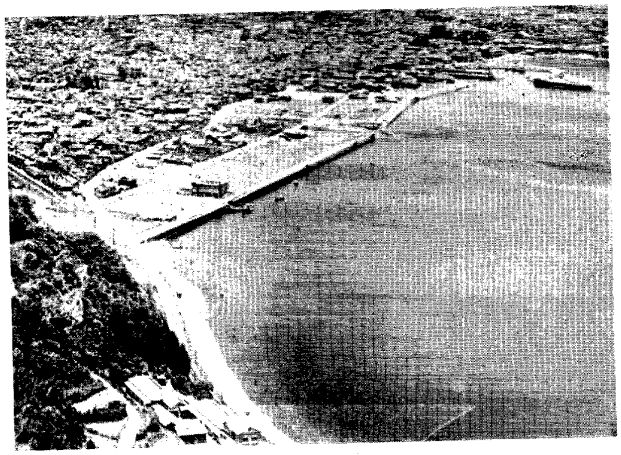

FIGURE VI -39. *Beppu.*
Waterfront, looking northwestward. 1935. Small inner harbor, enclosed by breakwater and pier, in upper right hand corner.

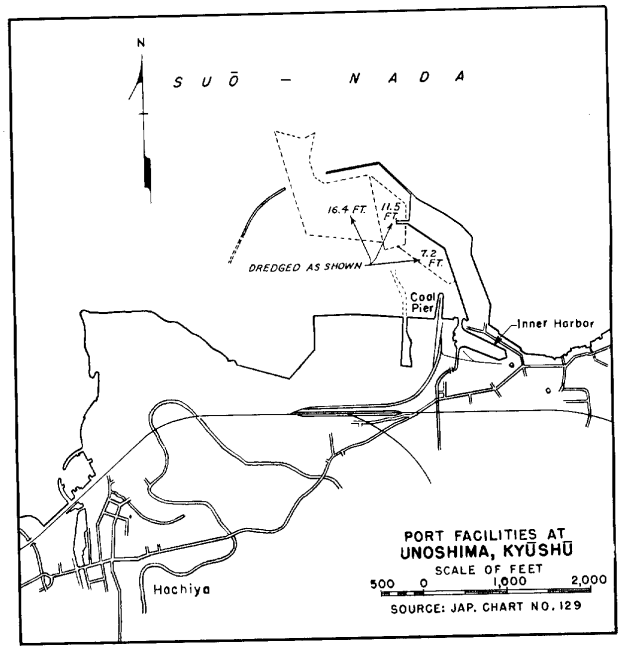

FIGURE VI - 40. *Unoshima.*
Sketch of harbor.

about 90 yards off the breakwater, and the 10-fathom contour about 175 yards off.

(*b*) *Landing facilities.* The pier, about 325 feet long and 60 feet wide, has depths of 12 feet along the southern side and 3 to 7 feet along the northern side. A crane is believed to be on the northwestern side of the harbor.

(*c*) *Clearance facilities.* Steamers of several Japanese companies call here. An electric railway connects Beppu with Ōita.

(*d*) *Supplies.* There are 3 hydrants at the pier, having a capacity of about 60 tons per hour.

(8) Unoshima (33° 37′ N, 131° 08′ E).

Unoshima is on the northern end of Kyushu Island on the southern shore of the Suo-nada.

(*a*) *Harbor.* The harbor, inclosed with breakwaters, has an entrance open to the north (FIGURE VI - 40). Depths inside are 16.4 to 4 feet. In the southeastern corner there is an inner harbor that dries. The 3-fathom curve lies about ¾ mile offshore. The entrance and the northern part of the harbor have been dredged to 16.4 feet.

Mean high water interval is 8 hours, 46 minutes. Spring tides rise 11 feet; neaps 8.2 feet; and the mean level is about 6.4 feet above lowest low water.

(*b*) *Landing facilities.* A channel leads across a wide shoal to a slip about 200 yards long in the southern part of the harbor. Depths in the slip are not known. Near the eastern end, the railroad coal loading pier, about 300 feet long and 70 feet wide, projects northward. It has no water alongside at low tide.

An area in the eastern part of the harbor has been dredged to 7 feet, with possible berthage of 508+410 feet. A pier pro-

jects about 100 feet westward in the northern part of the harbor. It has depths of 11.5 feet of water an all sides. Hachiya, westward of the harbor, has a small inclosed basin which dries. The railroad borders the southern edge.

(9) Usunoura-kō (33° 12′ N, 129° 37′ E).

Usunoura, a coal shipping port, is on the western coast of Kyūshū Island at the southeastern part of the Hirado-seto.

(a) Harbor. The harbor, a natural indentation in the coast northeastward from Taka-shima and about 4 miles eastward from Kozaki-bana, is about 300 yards wide at the entrance, slightly over 1 mile in length in a north—south direction, and averages about 200 yards in width (FIGURE VI - 41). Several small coves indent on its sides.

The depths at the entrance are about 7 fathoms; depths in the middle off the coal wharf are about 5½ fathoms. The 5-fathom contour enters the small bay for about half its length, lying about 50 yards offshore. It is well-sheltered from wind and seas from all quadrants.

There are no anchorage berths in the narrow harbor for other than small craft. It is believed that there are about 3 second-class anchorage berths in the outer approach.

The lunitidal interval in the vicinity is 8 hours 16 minutes; springs rise 9.8 feet; neaps 7.2 feet.

(b) Landing facilities. About 500 linear feet of quay have depths alongside of 18 to 20 feet. About 1,900 linear feet of frontage of filled-in land which may be quayed. Depths along this frontage range from 9 to 15 feet. The deep water quays are on the southern side of a small promontory on the western side of the harbor. The quay is served by railroad tracks. It is believed that there are several acres suitable for open storage dumps.

(c) Clearance facilities. The railroads serving the wharves connect with lines to Sasebo and other island points. There are believed to be about 6,800 linear feet of trackage on the wharves and quays.

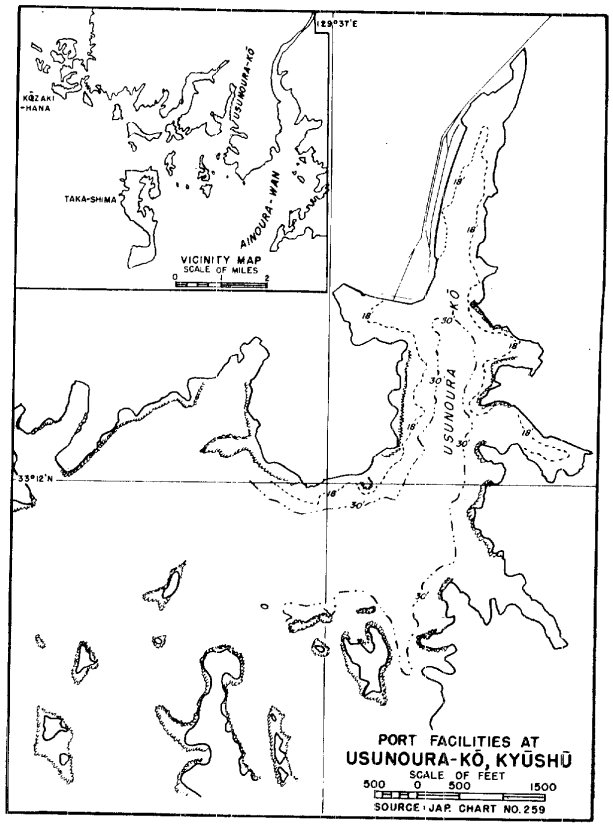

FIGURE VI - 41. *Usunoura-kō.*
Sketch of harbor.

(10) Matsushima-kō (32° 56′ N, 129° 36′ E).

Matsushima-kō is on Matsu-shima, a small island off the west coast of Kyūshū Island. The Matsushima Colliery Company operates the port and maintains the facilities.

(a) Harbor. Matsushima-kō indents about ½ mile southward to the wharves at the head of the inner cove (FIGURE VI - 42). This well-protected little bay lies on the northwestern end of the island about ¾ mile westward of Matsushima village. Near the southern end of the inner cove is the village of Hiraki.

The entrance is about 600 yards wide between Kushi-shima and the offlying reef eastward. The bay widens inside to over ½ mile and narrows to 200 yards at the entrance to the inner cove which extends about 500 yards southeastward.

The outer harbor is approached from Matsushima-suido in depths of 15 to 12 fathoms. The inner cove has 8 fathoms in the entrance and 5 to 11 fathoms inside. Shore reef borders both sides of the inner harbor near the entrance points.

There is room in Matsushima-kō for 1 second-class and 1 third-class anchorage berths. A mooring buoy is charted about 100 yards from the head of the inner harbor.

About 800 yards northeastward of Kushi-shima, an offlying island, the flood tidal current is easterly and the ebb is southwesterly; the change occurs at nearly high and low water. A rate of about 0.9 knot is attained.

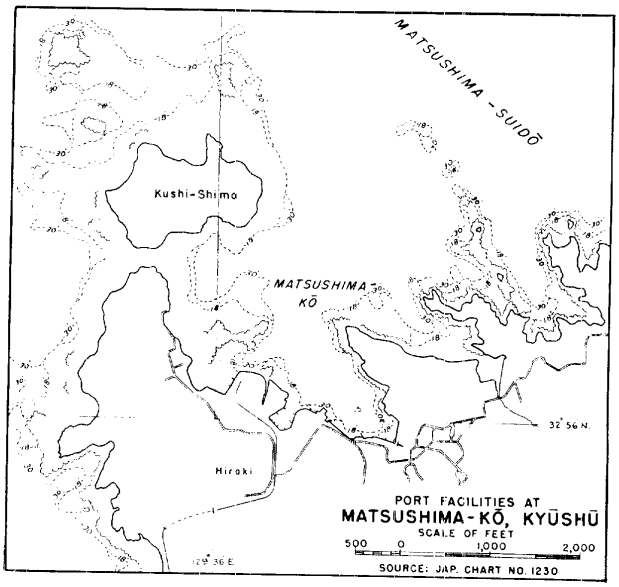

FIGURE VI - 42. *Matsushima-kō*
Sketch of harbor.

At Matsushima-kō mean high water interval is 7 hours, 59 minutes. Spring tides rise 9.8 feet; neap tides rise 7.2 feet. The mean level above Indian Spring low water (nearly lowest low water) is 5.7 feet.

(*b*) *Landing facilities.* The head of the inner harbor appears to be quayed with depths alongside of from 24 to 0 feet. A coal pier on the western side has depths of 32 feet near its head. It is equipped with a belt conveyor having a loading capacity of about 120 tons per hour. In a small natural basin, to the west of the inner harbor, there are depths of 5 to 13 feet. Several small piers extend into the basin.

*(11) **Minamata-kō*** (32° 12′ N, 130° 23′ E).

Minamata-kō is on the southwest coast of Kyūshū, facing the Yatsushiro-wan. Minamata lies about 2 miles northeastward of the mouth of the Minamata-gawa.

(*a*) *Harbor.* Minamata-kō is the water area southward of Myōjin-saki and fronted by Koki-shima. It is about 1 mile long in a north—south direction and about ½ mile wide. The entrance generally used is between the southern side of Koki-shima and Hadaka-se, an extensive shoal area lying about 700 yards southward from Koki-shima. In the fairway lies Nakano-se, a detached reef which shelves rapidly and which has least depths of 2½ fathoms of water over it. The depths in the entrance are about 10 fathoms; depths inside decrease to 4½ fathoms. A recently constructed jetty extends about 650 feet in a northwesterly direction from the southern side of the entrance. The harbor is partly protected by the off-lying islands and provides comparatively calm water inside except during westerly winds. There are 2 first-class or 3 second-class anchorage berths in the harbor.

(*b*) *Landing facilities.* Recently completed harbor works include a quay which extends along the southern shore for about 980 feet. The depths alongside are about 20 feet. Eastward from this quay there is a sea wall which is believed to extend about 1,000 feet along the shore, but which has shallow depths alongside. The area at the head of the small bay has been reclaimed.

(*c*) *Clearance facilities.* Improved roads lead from the wharves to the town and connect with inland and coastal points. A railroad connects with other island points. The trackage lies at the rear of the wharves.

C. Other landings.

Table VI - 12 gives briefly the significant information on the 27 other landings around Kyūshū and off-lying islands. Starting with Uchiumi, on the southeastern coast of Kyūshū, the other landings are listed in order of their location, moving counterclockwise around the island.

TABLE VI - 12

OTHER LANDINGS ON KYŪSHŪ ISLAND

NAME	COORDINATES		ENTRANCE CHANNEL		HARBOR DEPTH (ft.)	LANDING FACILITIES		REMARKS
	N	E	WIDTH (ft.)	DEPTH (ft.)		NUMBER AND TYPE	DEPTHS ALONGSIDE (ft.)	
1. Uchiumi	31°45′	131°28′	1500	48	9 to 60	1 wharf	9 to 12	Artificial harbor in river mouth
2. Oryuzako	31°48′	131°28′	1200	30	21 to 33	No data	No data	Natural harbor
3. Kumage-ura	33°40′	131°39′	⅛ mi.	18 to 24	15	3 landings	Dry at LW	Artificial harbor
4. Nakatsu	33°36′	131°12′	No data	No data	6 at h.w.	No data	No data	Harbor works in progress (1937)
5. Ashiya	33°53′	130°40′	600	4¼ to 10½	4¼ to 10½	No data	No data	Possible quay in river mouth
6. Fukuma	33°46′	130°30′	No data	No data	No data	1 pier	No data	—
7. Fuchiue	33°27′	130°02′	No data	No data	24 to 33	No data	No data	Small boat basin under construction (1935)
8. Minato	33°31′	129°57′	1500	21 to 42	6	No data	No data	Groin under construction (1938)
9. Takakushi	33°25′	129°50′	1500	42	18 to 30	Several small piers	Shallow	Harbor works in progress (1937); fishing harbor.
10. Imari-ko	33°17′	129°52′	2400	78 to 102	30 to 78	1 pier	No data	Coal conveyor on pier; small boat basins; harbor works in progress (1938).
11. Hirota, Hirato-jima	33°22′	129°34′	1200	30	25	1 pontoon	No data	Harbor work in progress (1937)
12. Matsushima	32°56′	129°37′	No data	60 to 78	42	3 piers	No data	—
13. Arikawa, Nakadori-shima	32°59′	129°07′	3000	60	36	No data	No data	Improved fishing port; harbor works in progress (1940).
14. Kamino-shima	32°43′	129°50′	1500	60 to 78	3	Landing	No data	Improved waterfront; small boat basin; harbor work in progress (1935).
15. Fukuda	32°44′	129°48′	No data	No data	15	1 pontoon	6	—
16. Futago-shima	32°39′	129°46′	No data	No data	66 to 150	1 pier	No data	Coal loading pier
17. Ha-shima	32°37′	129°45′	No data	No data	No data	4 piers	16 to 33	Conveyor on coaling pier
18. Tomie, Fukue-shima	32°37′	128°46′	No data	60	7½ to 60	1 pier 1 landing	8¾ to 12	Artificial harbor; boat basins.
19. Fukue, Fukue-shima	32°42′	128°51′	225	13½	9 to 13½	1 pier	10	Artificial harbor; facilities recently constructed near Tenjin-saki.

TABLE VI - 12 *Continued*

OTHER LANDINGS ON KYŪSHŪ ISLAND

NAME	COORDINATES		ENTRANCE CHANNEL		HARBOR DEPTH (ft.)	LANDING FACILITIES NUMBER AND TYPE	DEPTHS ALONGSIDE (ft.)	REMARKS
	N	E	WIDTH (ft.)	DEPTH (ft.)				
20. Mogi	32°42′	129°55′	No data	42	48 to 66	1 pier	No data	Small basin with landing
21. Minato-Shimabara	32°47′	130°23′	Narrow	30 and 7	No data	1 pontoon and 1 landing	No data	Extensive harbor works in progress (1938)
22. Furamado, Amakusa-kami-shima	32°25′	130°24′	900	35	30	Quay	No data	Cement loading dock with conveyors
23. Oniki, Amakusa-Shimo-shima	32°14′	130°00′	No data	60	21 to 27	Quay	6 to 8	Boat basins; harbor works in progress (1937).
24. Umedo	32°12′	130°23′	2700	60	19½ to 30	Quay	11	Crane, trackage, and warehouses.
25. Hashima	31°45′	130°12′	No data	48	No data	1 stone pier	No data	Small craft come alongside at HW
26. Makurazaki	31°16′	130°18′	No data	15 to 21	7½	Quay and landing	8	Artificial harbor; one 200-ton marine railway.
27. Yamakawa	31°12′	131°38′	1800	19½	120 to 138	Quay and piers	8 to 13	Base for fishing fleet

62. *Shikoku Island*

Kōchi on the south coast is the only principal port on Shikoku Island. Deep draft anchorage is available only off the entrance to the harbor and the main wharves can handle only two 450-foot vessels drawing 20 feet. There are 13 secondary ports around Shikoku Island; 7 are on the northern coast bordering the Inland Sea. Most of the secondary ports have small artificially protected harbors but relatively minor landing facilities. Eighteen other landings also are around the coast of the island. Secondary ports and other landings are described in this topic in order of their geographic location moving counterclockwise around the island. The secondary ports start with Susaki on the southern coast; the other landings start with Muroto on the southern coast.

A. Principal ports.

(1) Kōchi (33° 33′ N, 133° 33′ E).

Kōchi is on the estuary of the Kagami-gawa, on the south coast of Shikoku. Deep draft anchorage is available only off the entrance to the harbor. Two 450-foot vessels drawing 20 feet can be handled at the main wharves.

(*a*) *Harbor.* The harbor is in a basin on the western side of the estuary, which discharges into the head of Urado-kō, a shallow bight through which an approach channel has been dredged to the port (FIGURE VI - 43). The estuary dries over large areas. The basin has been dredged in part to depths of 5½ to 21 feet. The landing facilities are in this basin. A channel with a depth of 6 feet leads northward from abreast the basin to Maruyama-tai.

1. ENTRANCE CHANNEL. The entrance to the harbor, north of the point, Ryuzu-saki, is only about 250 yards wide. The depth at the entrance and in the dredged channel through Urado-kō is 18¾ feet. Dredging was under way in 1941 to increase the depth to 20 feet. A breakwater, under construction in 1941, extends in an east-northeastward direction from the northern part of Ryūzu-saki.

2. ANCHORAGES. Deep-draft anchorage is available only in the open roadstead off the entrance to the harbor. A prohibited anchorage area lies north of the breakwater at Ryuzu-saki. Small vessels can anchor in 1 to 3 fathoms, over mud, in Urado-ko, west of the approach channel.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water interval is 6 hours, 16 minutes; the mean range is 3.2 feet; and the spring range 4.6 feet.

4. LOCAL WEATHER. The average annual temperature is 60.08°, with a maximum (August) of 78.98°, and a minimum (January) of 41.36°. The average annual rainfall is 106.4 inches, with a maximum (September) of 15.9 inches and a minimum (January) of 2.75 inches. The mean relative humidity is 75.7%. The prevailing winds are northwest from September through May and southeast in June, July, and August.

(*b*) *Landing facilities.* The main wharves are located below the point, Hegi-hana, at the edge of the dredged channel. These wharves provide about 1,150 feet of berthage on the south side, with a depth of 21 feet; about 250 feet on the eastern side and 660 feet on the northeastern side with depths of 9 feet alongside. The main wharf can accommodate two 450-foot vessels drawing 20 feet.

A number of piers, with depths of ¾ to 2½ fathoms near their heads, are opposite the main wharves, and off the dredged area. At least 2 cranes are located on these piers. Two piers are in the northwestern part of this basin, but off the dredged area. One is a pontoon landing pier, 351 feet long, and 18 feet wide, connected by electric railway with Kochi. Depths are about 15 feet near the head of the landing. The other pier, south of the floating pier, is smaller and is surrounded by shoal water. A mooring buoy was to the west of the main wharves and near the end of the landing.

There are 4 piers on the end of the spit projecting just north of the entrance, opposite Ryuzu-saki. Depths alongside vary from 1½ to 9 feet. The extreme westerly pier is equipped with a crane. On the east side of Urado-ko there are 2 piers with depths of 1½ and 3 feet, respectively.

Tugs and lighters are available in the harbor.

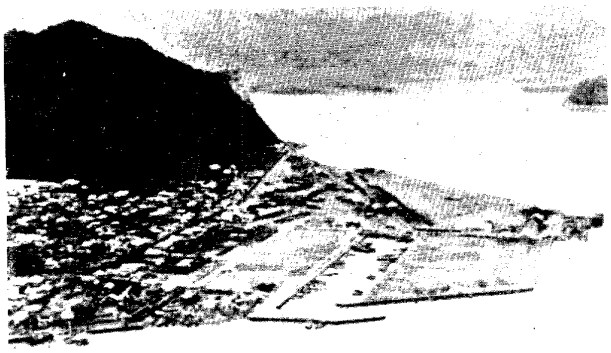

FIGURE VI - 45. *Susaki.*
Harbor, looking northward.

southwestern side, with charted depths of 5 to 12¼ feet alongside.

Railroad tracks extended around the northwestern, southwestern, and part of the southeastern sides of the northwestern basin.

(*c*) *Clearance.* Sumoto is the terminus of a railroad extending across the island to Fukura. It is on the improved coastal road, and another improved road leads westward across the island. Local steamer connections are maintained.

(4) Takamatsu (34° 21′ N, 134° 03′ E).

Takamatsu is on Takamatsu-wan in the Inland Sea, on the north coast of Shikoku. The port has some landing facilities in a well protected basin in front of the town.

(*a*) *Harbor.* Takamatsu-kō is an artificial harbor formed and protected by 3 breakwaters (FIGURE VI - 48). The north breakwater is detached and the 130-yard harbor entrance is west of it. Depths of 4 to 6 feet are on both sides of this breakwater.

The main entrance and the greater portion of the western half of the 125-acre harbor is dredged to 20 feet; the remainder,

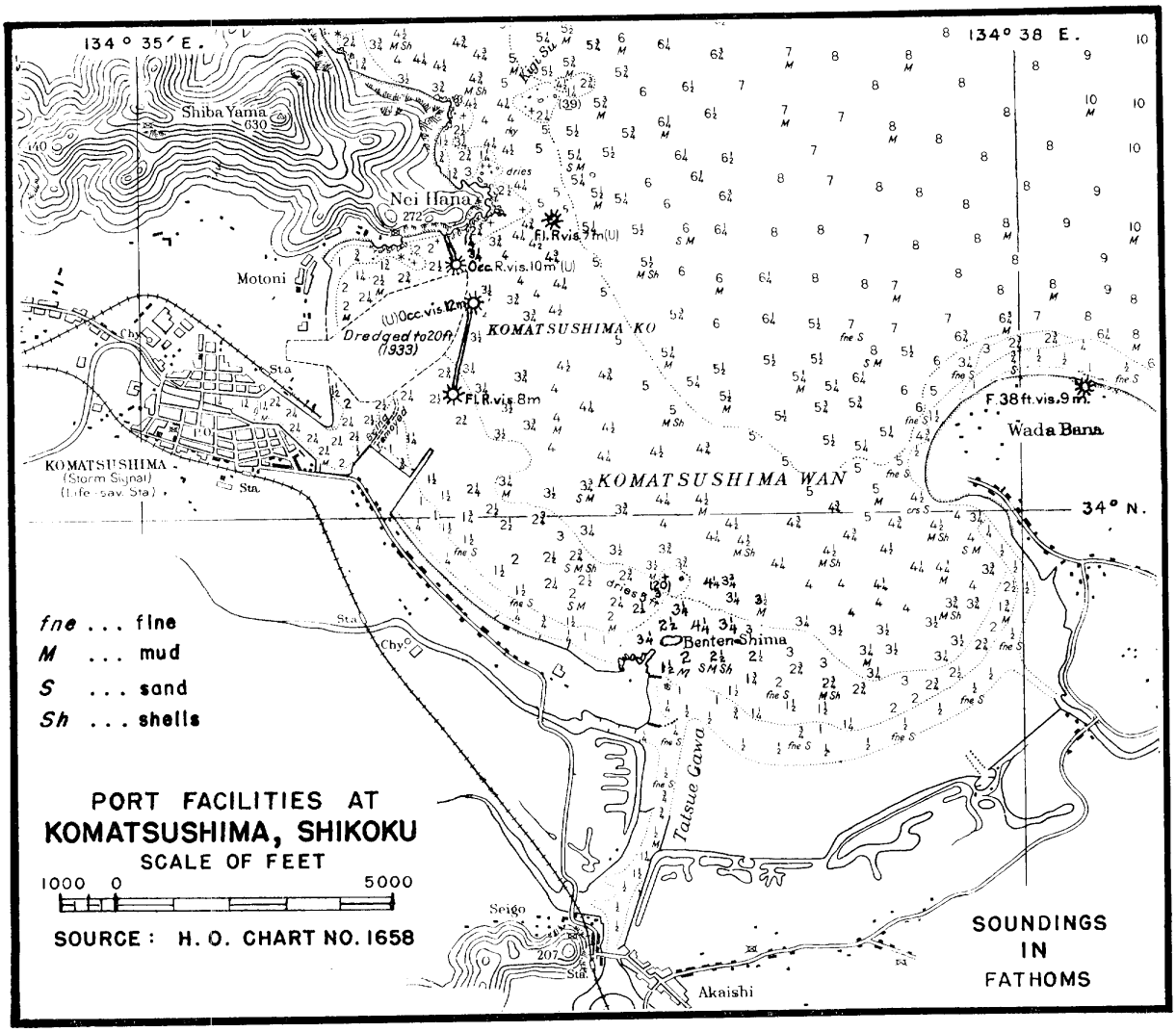

FIGURE VI - 46. *Komatsushima.*
Map of harbor.

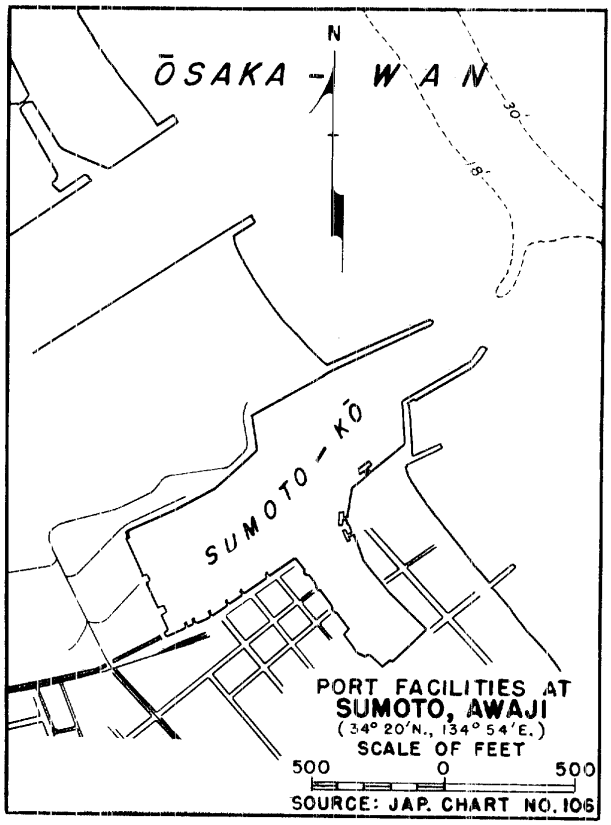

FIGURE VI - 47. *Sumoto.*
Sketch of harbor.

near the west breakwater, is dredged to 14 feet. The eastern half, except near its eastern end, has a 12-foot depth. A small basin, Shin-kō, east of the southern end of the west breakwater, is dredged to 12 feet. An arm extending southward, near the eastern end of the harbor, has a 7-foot depth; Somaba-gawa, extending southward along the east breakwater, has depths of 3 to 15 feet. Two 1¾-fathom shoals lie in and near the main entrance, while a number of 1- and 1¾-fathom shoals lie in the eastern section of the basin.

A detached basin, formed and protected by 2 curvilinear breakwaters and a detached breakwater, is at the west end of town about 1,500 yard west of the main harbor. The basin, about 150 yards wide and 100 yards deep, has depths of 2 to 5 feet inside and 3 feet in the entrance.

The mean high water tidal interval at Takamatsu-ko is 11 hours, 19 minutes; mean high water springs rise 7¼ feet; and neaps 5.0 feet.

(*b*) *Landing facilities.* Two floating passenger piers are in the western part of the harbor. The easternmost one (FIGURE VI - 49) is about 480 feet long and 35 feet wide, and has a 20-foot depth alongside; the westernmost one is for use of the railroad. The 20-foot dredged depth of the basin is about 50 feet from the face of the quay east of these piers (FIGURE VI - 50). Small craft berth at this quay; along the eastern end the cap of the seawall slopes upward to the level of the reclaimed ground in the rear. Cargo is apparently handled by lighter or sampan over the seawall.

There are other landing places off the eastern part of the harbor (FIGURE VI - 51). A dredged area 7 feet deep extends southward from this part of the harbor. Similar depths are in the basin at the mouth of Somaba-gawa. Another waterway borders the south side of the storage and warehouse area east of the main harbor. No data are available concerning landing facilities in the detached basin west of town.

(*c*) *Storage facilities.* Warehouses and open storage are found east of the main harbor on a 50-acre area made of land from the harbor dredging. Another group of warehouses are near the quay and wharf on the harbor frontage.

(*d*) *Clearance facilities.* Takamatsu is the seaport terminal on the Sanuki Railroad; the railroad branches northeastward to Nagao and southeastward to Kotohira. The coastal highway along the Inland Sea passes through the town, and secondary roads run into the interior of the island.

(*e*) *Supplies.* Fresh water is piped to the eastern (general use) pier. There are no water boats. A bulk oil plant is west of the main basin and a separate boat basin borders it to the westward. Two tanks are on the waterfront at Takamatsu and 2 more are at the east end of the harbor. Electricity for lighting is indicated at the landing facilities.

(5) Sakaide (34° 20′ N, 133° 52′ E).

Sakaide is on the north coast of Shikoku, 3¾ miles southward of Nō-saki.

(*a*) *Harbor.* The harbor is a narrow inlet in the low shore line fronting the town (FIGURE VI - 52). On its western side, there is some reclaimed land; from the northeastern corner of this land a breakwater extends 200 yards in a north-northeasterly direction. The approach to the port is from the northeast except for light draft vessels. Depths vary from 4½ to 5½ fathoms in the entrance channel. Depths inside are generally 20 feet. From the head of the harbor, a basin extends westward along the southern side of the reclaimed land.

(*b*) *Landing facilities.* On the eastern side of the reclaimed land, there is a quay approximately 800 feet long, with 20 feet of water alongside; this provides berthage for two 350-foot vessels. The basin at the head of the harbor is quayed, but depths cannot be determined from available data. Water is piped to the wharf.

(*c*) *Clearance facilities.* The unloading capacity of the port is estimated to be 700 short tons per day.

(6) Tadotsu (34° 16′ N, 133° 45′ E).

Tadotsu is on the northern coast of Shikoku Island, about 13 miles eastward of Mi-saki.

(*a*) *Harbor.* Tadotsu-ko is an artificial harbor enclosed by 2 main breakwaters: the eastern one is about 330 yards long; and the western one is a curved structure, about 550 yards long (FIGURE VI - 53). The harbor is divided into an outer harbor and inner harbor by another breakwater about 210 yards long extending northeast—southwest.

The approach to the harbor has charted depths of 2¾ fathoms. The entrance to the outer harbor, between the heads of the east and west breakwaters, is about 350 yards wide and 16½ feet deep.

The 32-acre outer harbor is about 450 yards long and from 275 to 450 yards wide and had depths of 16½ feet in 1939. The east breakwater has a high outer wall and a wide roadway space. This harbor is mostly used by passenger boats and cargo steamers which sometimes enter the port to await better weather conditions.

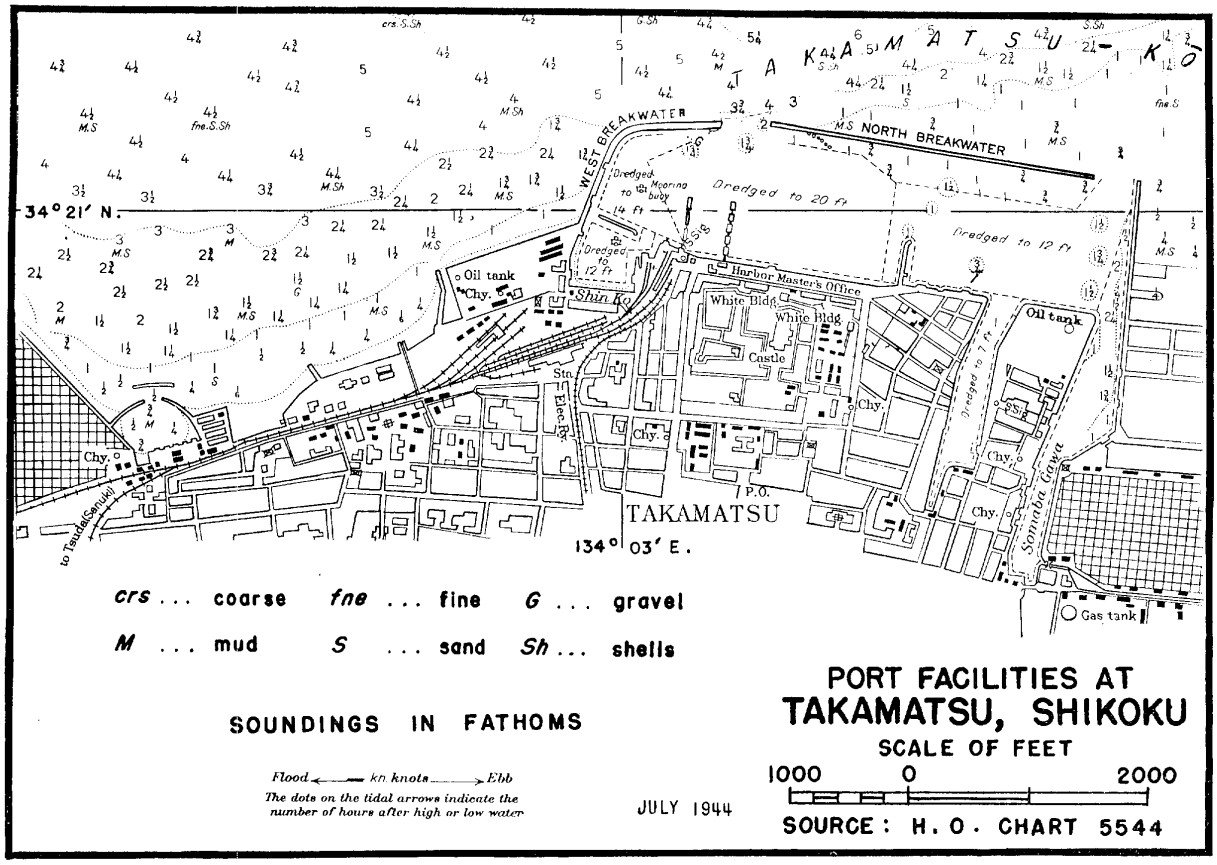

FIGURE VI - 48. *Takamatsu.*
Map of harbor showing location of port facilities.

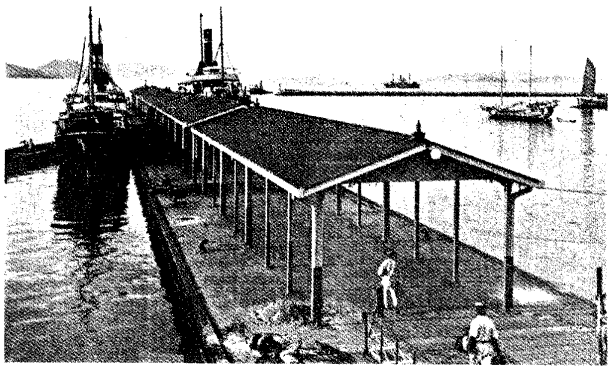

FIGURE VI - 49. *Takamatsu.*
Floating pier, looking north-northwestward.

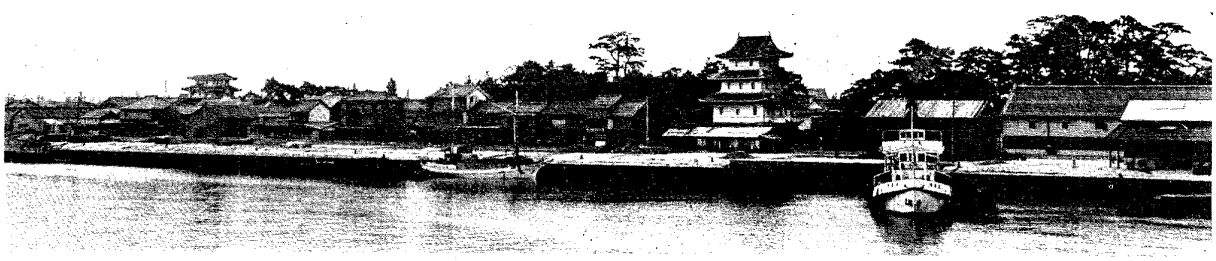

FIGURE VI - 50. *Takamatsu.*
Quay E of floating pier, looking southeastward. 25 September 1929.

FIGURE VI - 51. *Takamatsu.*
Quay in SW corner of eastern part of harbor, looking southwestward.

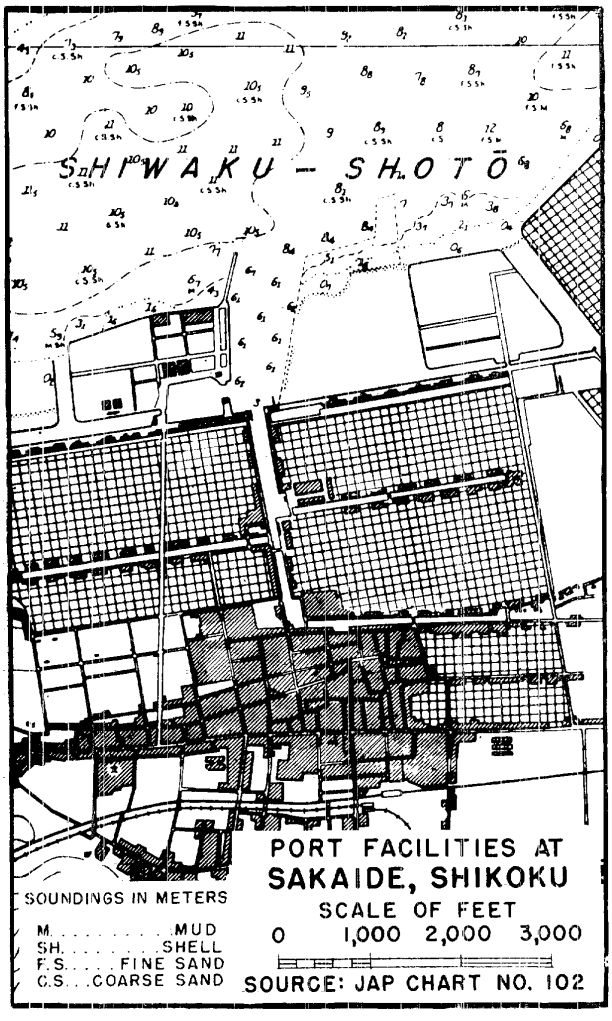

FIGURE VI - 52. *Sakaide.*
Map of harbor.

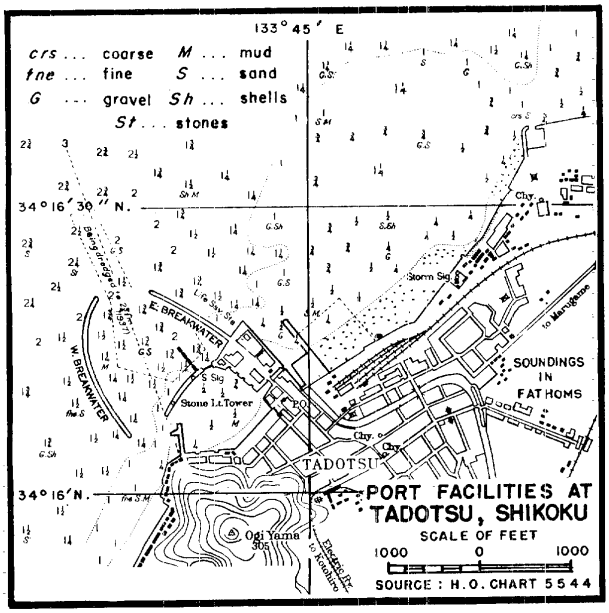

FIGURE VI - 53. *Tadotsu.*
Map of harbor.

The 17¼-acre inner harbor is about 275 yards wide and a maximum of 325 yards long, and has depths of about 6 feet. This harbor is used by sailing and fishing vessels.

The 3-fathom contour lies about 1,150 yards off the head of the west breakwater. The flood current sets southwestward, approximately paralleling the shore.

(*b*) *Landing facilities.* There is a floating wooden pontoon pier, 250 feet long, on the southeastern side of the outer harbor, with depths of 16½ feet (FIGURE VI - 54). It is lighted and fitted with bollards on both sides. Boats can also berth alongside the east breakwater. Wharves in the inner harbor are equipped with cranes. The inner harbor also has a few one-story warehouses.

(*c*) *Clearance facilities.* Tadotsu is on the standard-gauge, single-track railroad of the Yosan Line; the narrow-gauge, light Kotohira Electric Line leading southward; the coastal highway; and a highway leading southward into the interior through Kotohira. Six Japanese steamship lines call regularly at Tadotsu.

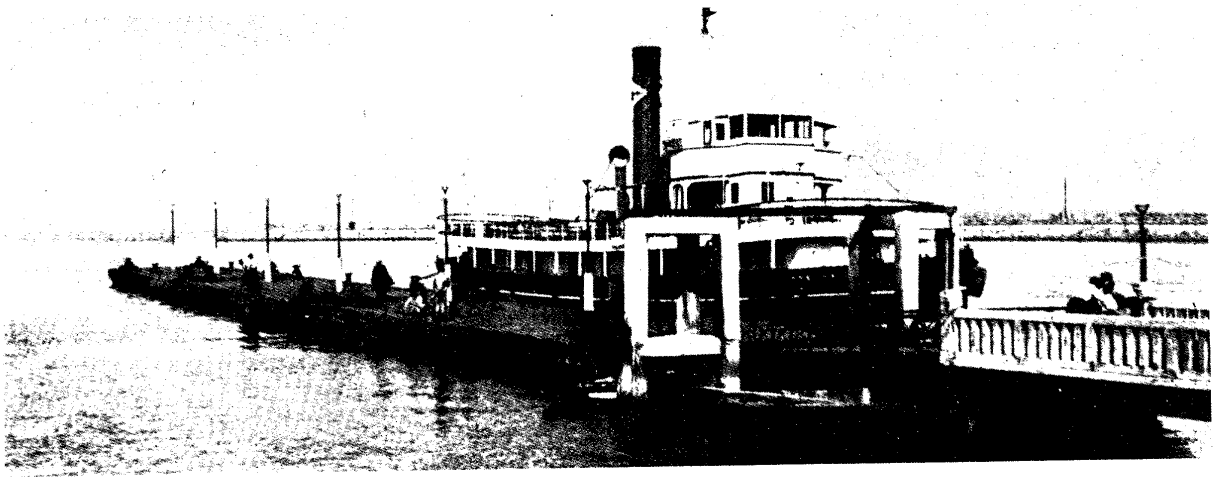

FIGURE VI - 54. *Tadotsu.*
Floating pier in outer harbor, looking northward. East breakwater in background.

(7) Kannonji (34° 07′ N, 133° 39′ E).

Kannonji is on the northern coast of Shikoku Island between the mouths of 2 rivers about 9 miles southward from Mi-saki.

(a) Harbor. Kannonji-kō is an artificial harbor, south of the mouth of the Saita-kawa (FIGURE VI - 55). The roadstead is entirely open and 2 breakwaters enclose a harbor dredged to 6 feet. On the southern side of the river, a breakwater, which extends out about 2,500 feet, has some reclaimed land on its southern side. About 920 feet southward and parallel to it, a second breakwater projects outward from the southern side of the Ichinotani-kawa, which discharges between the incurving ends of the breakwaters.

Approach to Kannonji is in 10 to 13 fathoms with the 10-fathom curve about 1 mile offshore. A wide shoal borders the shoreline. The entrance between the breakwaters is about 125 feet wide; depths of 26 feet are just outside. A dredged channel 165 feet wide and 6 feet deep leads to the quays at the town.

A mole or training dike extends about 1,400 feet west-southwestward from the northern side of the mouth of the extremely shallow Saita-kawa.

(b) Landing facilities. The filled land which occupies the northeastern quarter of the harbor has a rectangular basin with a dredged depth of 6 feet. The basin is about 700 feet long and indents 300 feet. The 3 sides appear to be quayed, providing 1,300 feet of berthing space. The inner end of the southern breakwater is widened to about 100 feet; 600 feet of this wide breakwater are in depths of 6 feet.

(c) Clearance facilities. The streets laid out on the filled land in the harbor connect directly with the streets of the town and to the coastal roads. The coastal railroad passes on the south side of the town. Three steamship lines maintain scheduled calls at the port.

(8) Niihama (33° 58′ N, 133° 16′ E).

Niihama is on the northern coast of Shikoku Island, on the southern side of the Hiuchi-nada. The primary port facilities are used by a chemical plant.

(a) Harbor. Niihama-kō is a 400-acre artificial harbor protected on the western side by reclaimed land which extends northward from the mainland shore towards Miyo-shima, an islet lying about 1,500 yards offshore (FIGURE VI - 56). A breakwater extends about 200 yards in a northeastward direction from the eastern side of Miyo-shima to form the western arm of the northern protective works; and another breakwater extends in a northwestward direction from the shore on the eastern side of the mouth of the Shirinashi-kawa, northeastward of the town, to form the eastern arm of the harbor protective works.

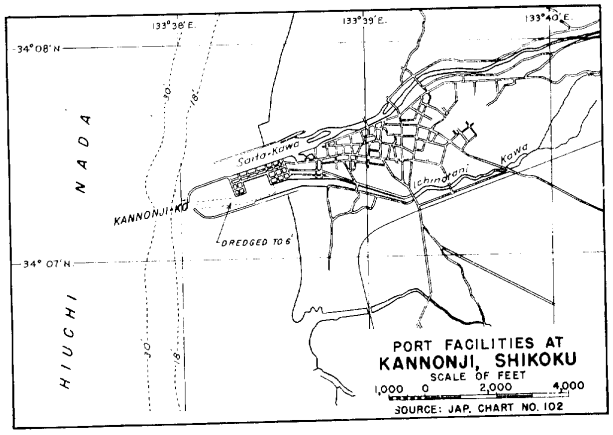

FIGURE VI - 55. *Kannonji.*
Sketch of harbor.

The entrance between the ends of the breakwaters is about 900 feet wide, with depths of about 5 fathoms. A dredged channel, leading from the entrance to the wharves and quays, is about 350 feet wide and has dredged depths of 28 feet in 1938. Eastward of this channel the depths are about 12 to 15 feet. Another dredged channel leads eastward and southeastward from the above-mentioned channel, with respective depths of 22 and 11½ feet, towards a reclaimed area on the southeastern side of the harbor waterfront.

Southeastward of this reclaimed area is a basin for small craft; another basin, which has a small pier, is in the southwestern part of the harbor.

Mooring buoys were located off the reclaimed area on the

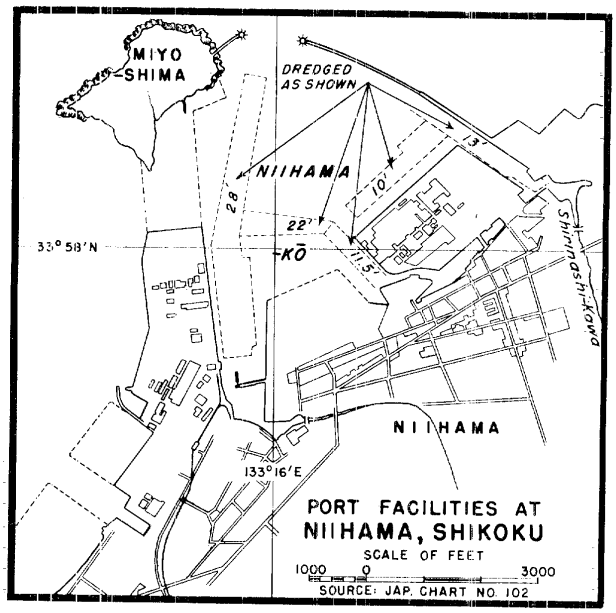

FIGURE VI - 56. *Niihama.*
Sketch of harbor.

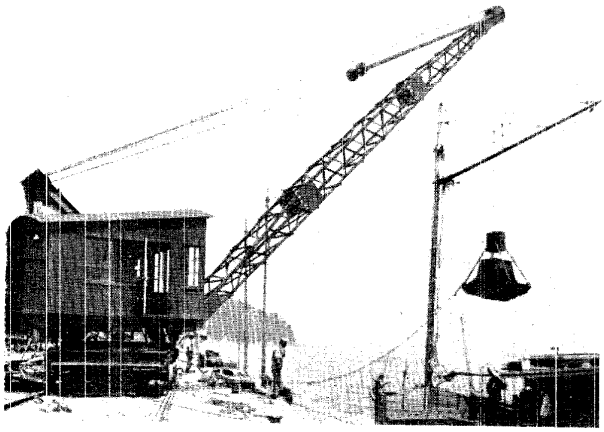

FIGURE VI - 57. *Niihama.*
Traveling crane on quay on W side of harbor, looking northward. 20 August 1930.

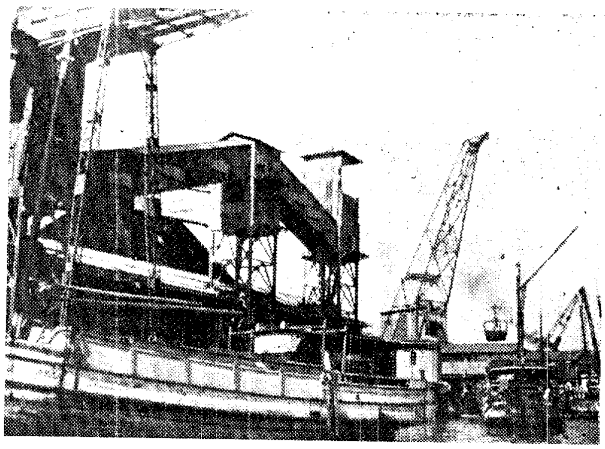

FIGURE VI - 58. *Niihama.*
Cranes on quay on W side of harbor, looking northwestward.

FIGURE VI - 59. *Niihama.*
Floating pier at head of harbor, looking westward. 22 March 1937.

western side of the harbor; anchorage is prohibited in their vicinity.

Anchorage inside the harbor in depths of about 2½ fathoms is suitable for small craft only. There are no data available regarding anchorages outside the harbor, but there is believed to be ample anchorage about ½ mile offshore, westward of the town and Miyo-shima, in depths of about 4½ fathoms, over mud bottom. Telegraph cables extend from the town to Mino-shima.

The lunitidal interval is 11 hours 10 minutes; springs rise 12 feet; neaps 9 feet; and the mean sea level is 6.9 feet.

(b) Landing facilities. The reclaimed land on the western side of the harbor is quayed along its eastern shore. Depths alongside are believed to be about 18 to 22 feet. This quay is about 2,300 feet long and is equipped with railroad tracks and a traveling crane of about 15 tons capacity (FIGURE VI - 57). Several transporter and stationary cranes are also located on this quay (FIGURE VI - 58). This reclaimed area is mainly used by the Sumitomo Chemical Works.

At the head of the harbor is a floating pier, believed to be a passenger landing, consisting of several pontoons moored together (FIGURE VI - 59). Several covered but sideless sheds are located along the center of these pontoons. The floating pier is believed to be about 100 feet long and 30 feet wide; the depths alongside are unknown.

The reclaimed land on the southeastern shore of the harbor is reported to have depths along its 2,300-foot northwestern side of 10 to 13 feet. The 800-foot southwestern side of this area has depths of 10 feet or more alongside the quay. Both these sections are reached by extensions of the dredged channel.

(c) Clearance facilities. The town is served by the State Railways. The western reclaimed area is served by railroad tracks. Improved roads lead from the wharves to the town and the island highway system.

(d) Supplies. Water can be obtained. Fuel oil is reported to be obtainable. Electric current is believed available. The Sumitomo Chemical Works have a power plant located near the head of the railroad line about 10 miles southward of the town.

(9) Imabari (34° 04′ N, 133° 00′ E).

Imabari is at the southeastern end of Kurushima-kaikyō.

northwestward of Sosha-gawa, a small river flowing into Hiuchi-nada, on the northern coast of Shikoku Island.

(*a*) *Harbor.* A breakwater, about 550 yards long, projects in a northwestward direction from a position about 1,400 yards northwestward of the mouth of the Sōsha-gawa (FIGURE VI - 60). Inside this breakwater, the principal part of the harbor has depths of 18½ to 25½ feet. A basin, with a depth of 9 feet, is at the head of the harbor.

The mean high water interval is 10 hours, 52 minutes. In Kurushima-kaikyō, springs rise 13½ feet and neaps 9 feet. Flood currents set southeastward at 3¼ knots, and the ebb current sets northwestward with a velocity of 2 knots.

(*b*) *Landing facilities.* Three floating piers and a quay, with depths of 18 to 25 feet alongside, are reported, but their locations are not known. There is a landing stage in the basin at the head of the harbor. There are 2 privately owned tankers at the port and water is available.

(10) Takahama (33° 53′ N, 132° 35′ E).

Takahama is on the west coast of Shikoku Island, near the southern entrance to Takahama-seto. Four and one-half acres of land had to be reclaimed to provide landing facilities.

(*a*) *Harbor.* Takahama-kō, on the southern part of the eastern side of Takahama-seto, is located in a cove opposite the southeastern point of Gogo-shima (FIGURE VI - 61). Takahama-seto has a least width of 900 yards; there is deep water through its central part. Depths in the harbor vary from 1½ to 6 fathoms; the 10-fathom depth almost aligns the western ends of both the northern and southern points of the cove.

Anchorage should be taken somewhat westward of the center line of Takahama-seto in order to keep clear of the fairway and to avoid the strong tidal current.

Currents in the strait, off the port, ebb and flood, at 3¼ knots, but a strong tidal current of 5 to 6 knots is reported at the south entrance.

(*b*) *Landing facilities.* Two floating piers, about 230 feet long, project into the harbor to charted depths of 14 to 16 feet (FIGURE VI - 62). Berths are provided for 2,000-ton vessels at each of the 2 piers.

The quay wall along the face of the harbor is fronted by shallow water. A crane of 15 tons capacity is located on the quay (FIGURE VI - 64).

The narrow wharf area does not permit storage buildings and grounds, but a few small buildings are available. A railroad serves the southern end of the quay. Boats call regularly at the port.

(11) Mitsuhama (33° 52′ N, 132° 43′ E).

Mitsuhama is on the west coast of Shikoku, close southward of the southeastern entrance point of Takahama-seto.

(*a*) *Harbor.* The harbor is protected by a curving breakwater (FIGURE VI - 61). Depths in the outer harbor are 13 to 17 feet, except toward the northern end and along the eastern shoreline where depths vary from ¼ to 1½ fathoms. The inner harbor, which lies eastward of the piers, is divided into 2 parts; the southern and somewhat deeper part has 6½ to 10 feet. The Hori-gawa flows into the inner harbor.

Anchorage can be obtained in 8 fathoms, over sand bottom, about 600 yards west-northwestward of the head of the breakwater, but in winter, during strong westerly winds when heavy seas run southward of Gogo-shima, vessels should anchor about

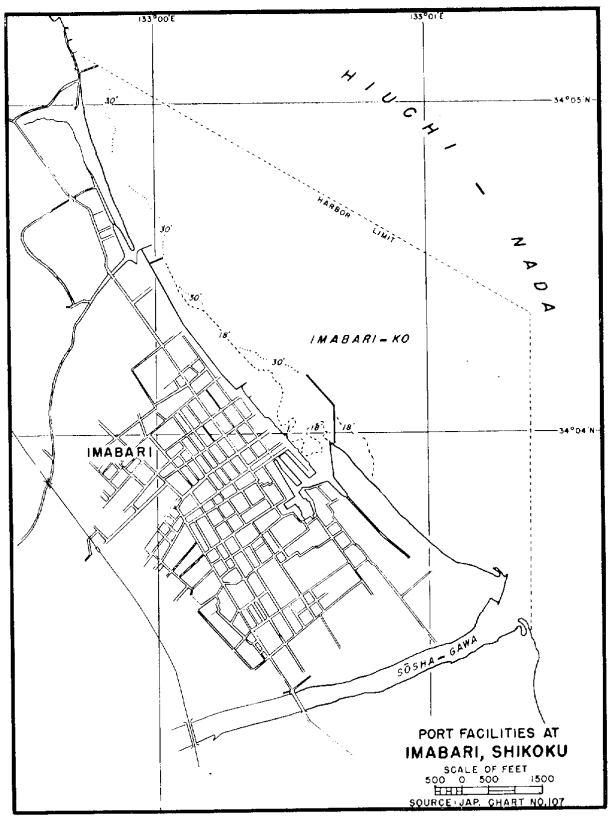

FIGURE VI - 60. *Imbari.*
Sketch of harbor.

600 yards off Tomari, on the western side of Takahama-seto in depths of 18 fathoms.

In Mitsuhama road, high water full and change is 9 hours, 38 minutes. Springs rise 12¼ feet and neaps rise 8 feet.

(*b*) *Landing facilities.* Two floating piers project to dredged depths of about 13 feet from the face of the quay east of the root of the breakwater. The shoreline of the inner harbor is almost entirely quayed, with a dredged depth of 6 feet alongside approximately 3,100 feet on the southern and eastern sides. Shoal water fronts the quays on the northern side.

Steamer communication is maintained. Highways and a railway serve the town and port. Water is supplied from waterboats or from the piers. Coal is stocked.

(*c*) *Repair facilities.* There is a marine railway with a lifting capacity of 200 tons.

(12) Yawatahama (33° 27′ N, 132° 25′ E).

Yawatahama is on the west coast of Shikoku Island, on the eastern side of the Bungo-suidō.

(*a*) *Harbor.* Yawatahama-kō is an inlet which indents the coast about 2 miles (FIGURE VI - 63). The entrance, north of Suwa-saki and open to westward, is about 1 mile wide, free from dangers, and has depths from 20 to 23 fathoms. There are depths of 11 to 19 fathoms in the middle part. The inlet gradually narrows toward its head where it is less than 300 yards wide.

The old harbor is in the head of the inlet, northward of a projection of the shore. The part southward of the projection is the

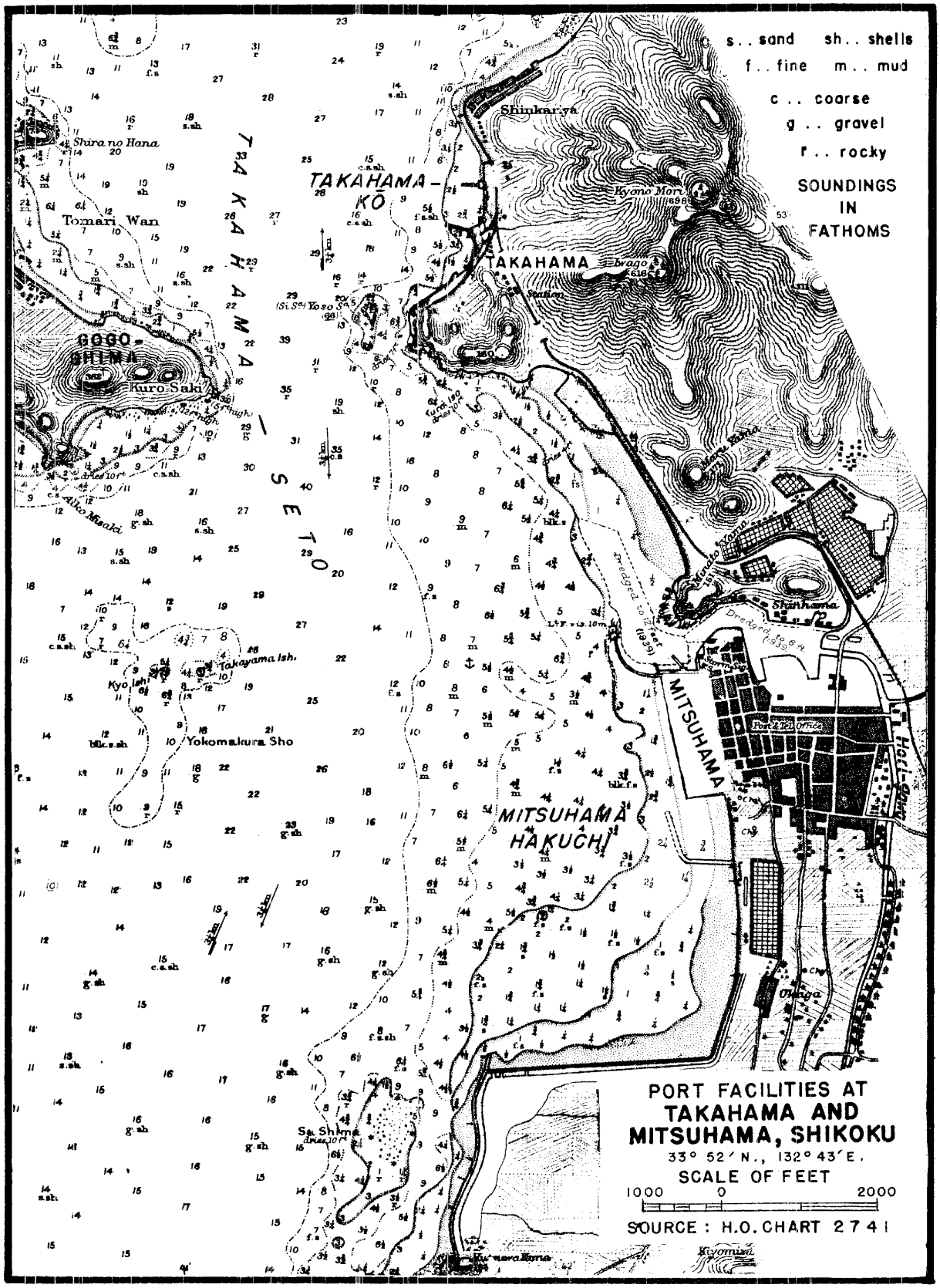

FIGURE VI - 61. *Takahama and Mitsuhama.*
Map of harbors.

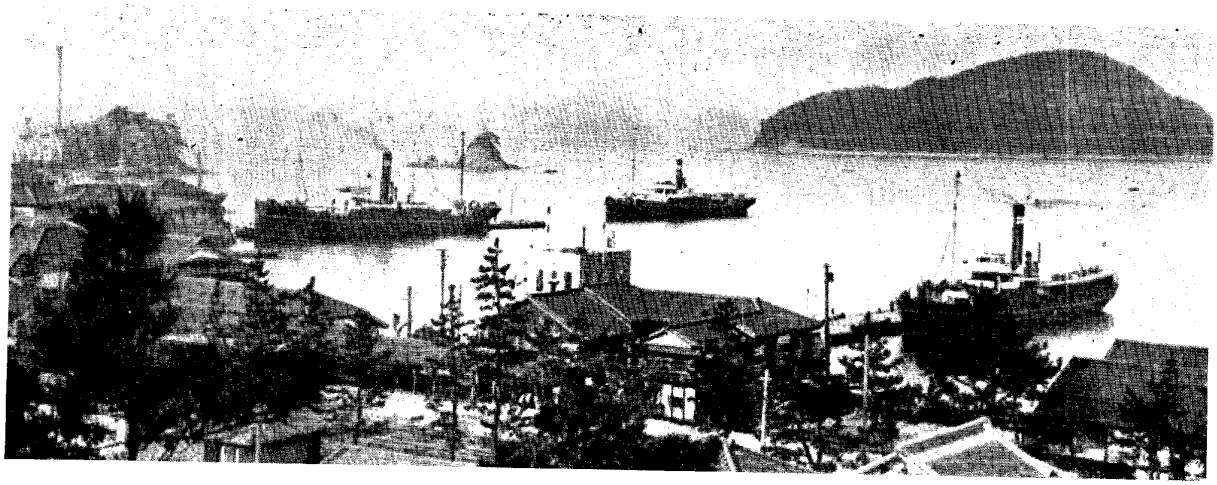

FIGURE VI - 62. *Takahama.*
Harbor, looking southwestward, showing floating piers.

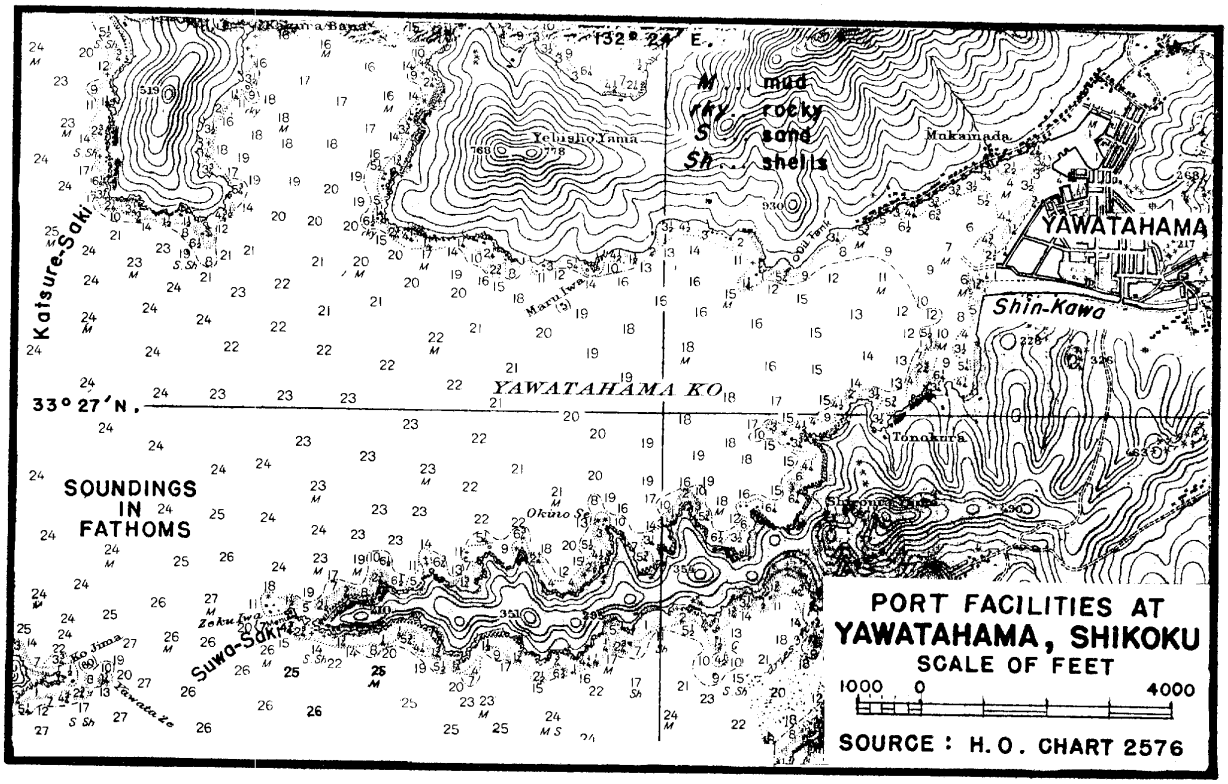

FIGURE VI - 63. *Yawatahama.*
Map of harbor.

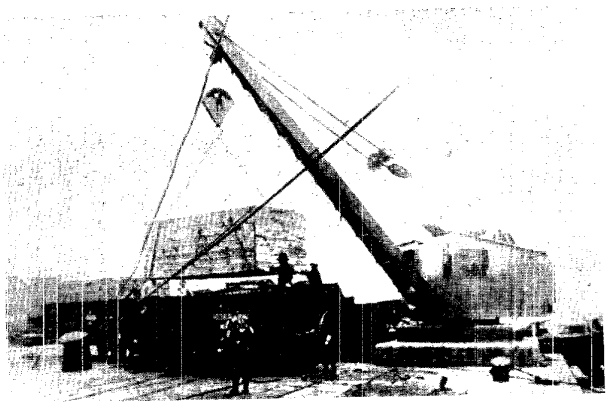

FIGURE VI - 64. *Takahama.*
Crane on quay.

new harbor. Depths in the new harbor are 2½ to 6 fathoms; 1-fathom depths are in the old harbor basins.

The mouth of the Shin-kawa largely dries at low water springs. A breakwater extends westward from the point on the northern side of the river mouth.

Eight first-class, 2 second-class, and 3 third-class anchorage berths are available in Yawatahama-kō. Anchorage exposed to westerly winds is found in 7 to 9 fathoms off mouth of Shin-kawa.

High water full and change is at 7 hours, 37 minutes. Springs rise 8¼ feet; neaps 5¼ feet.

(*b*) *Landing facilities.* The projection which divides the harbor has quays on its 3 sides, each about 400 feet long. Part of the northwestern side has a depth of 19 feet. A floating pier, with depths of 16½ feet, projects from the northwestern corner of the quayed projection.

Yawatahama is a port of call for small steamers and coastal vessels. The quays are all directly connected to the town streets. The drinking water is not of good quality.

(13) Uwajima (Kabasaki) (33° 13′ N, 132° 33′ E).

Uwajima is on the southwest coast of Shikoku.

(*a*) *Harbor.* Uwajima-kō is in the eastern part of Uwajima-wan, east of Ku-shima (FIGURE VI - 65). It is entered between Udono-saki, the northern point of Ku-shima, and Tadanami-hana nearly ½ mile to the northward. The passage south of Ku-shima is narrow between the shoals extending from each shore. South of the reclaimed land on the eastern side of the harbor there is a dredged area, which had a depth of 14¾ feet in the outer part and 8¼ feet in the inner part in 1941.

Anchorage is available in about 7 fathoms, over mud, about 600 yards westward of the head of the northern pier at Uwajima. There is anchorage in the southwestern part of the harbor, off the southeastern side of Ku-shima, but it is seldom used.

In Uwajima-wan the high water interval, full and change, is 7 hours, 30 minutes. Springs rise 8¼ feet; neaps 5¼ feet.

(*b*) *Landing facilities.* There are 2 floating piers, each having a depth of 13 feet at its head, north of the reclaimed land on the eastern side of the harbor. The reclaimed area is faced by quays totalling about 3,500 feet, with depths of 4½ to 16½ feet alongside. About 900 feet of this berthage has charted depths of 16½ feet. The shoreline bordering the dredged areas south of the reclaimed land is also faced with quays, but the dredged depths of 8¼ and 14¾ feet are not generally carried to the face of the quaywalls. Storehouses are available. A railroad leads northward from the port.

C. Other landings.

TABLE VI - 13 lists the 18 other landings around the coast of Shikoku and briefly gives the significant information about each.

TABLE VI - 13

OTHER LANDINGS ON SHIKOKU ISLAND

NAME	COORDINATES		ENTRANCE CHANNEL		HARBOR DEPTH (FT.)	LANDING FACILITIES NUMBER AND TYPE	LANDING FACILITIES DEPTH ALONGSIDE (FT.)	REMARKS
	N	E	WIDTH (FT.)	DEPTH (FT.)				
1. Muroto	33°13′	134°09′	No data	No data	6 to 12	No data	No data	Fishing harbor protected by breakwaters; harbor works in progress (1936).
2. Mugi	33°40′	134°25′	1,500	18	7 to 15	No data	No data	Harbor works in progress (1938)
3. Yuki	33°46′	134°36′	No data	No data	No data	2 piers	No data	Small bay
4. Yura	34°17′	135°56′	300	9.5 to 11	24 to 30	Numerous piers	No data	Enclosed harbor
5. Toshima	34°33′	134°56′	Open	15 to 20	10 to 15	No data	No data	Harbor works in progress (1937)
6. Hiketa	34°14′	134°24′	No data	No data	No data	1 wharf	6	Artificial harbor; breakwater serves as wharf.
7. Shido	34°19′	134°10′	E-½ mi. W-½ mi.	36 to 48 42 to 60	Shallow	1 wharf	8	Artificial harbor
8. Marugame	34°17′	133°48′	300	12.1	6 to 12	1 wharf	12.1	Harbor inside protected river mouth
9. Kawanoe	34°01′	133°34′	No data	24	4	1 wharf	No data	Artificial harbor at river mouth
10. Kikuma	34°02′	132°50′	Open	60	12	1 pontoon	No data	Also small basin
11. Hojo	33°58′	132°53′	No data	No data	8 to 10	Pontoons	No data	Artificial harbor
12. Gunchu	33°45′	132°42′	No data	No data	6 to 16.5	1 pontoon	No data	Harbor works in progress
13. Nagahama	33°37′	132°29′	Open	No data	13 to 18	1 pier	No data	Artificial harbor at mouth of river

TABLE VI - 13 *Continued*

OTHER LANDINGS ON SHIKOKU ISLAND

NAME	COORDINATES N	COORDINATES E	ENTRANCE CHANNEL WIDTH (FT.)	ENTRANCE CHANNEL DEPTH (FT.)	HARBOR DEPTH (FT.)	LANDING FACILITIES NUMBER AND TYPE	LANDING FACILITIES DEPTH ALONGSIDE (FT.)	REMARKS
14. Kucho	33°28′	132°20′	1¾ mi.	120	20 to 120	1 wharf	shoal	Deep, open bay.
15. Shitama—Goda	33°26′	132°25′	1½ mi.	150	60 to 150	Quays	No data	Also small basin in partly sheltered inlet
16. Okuchi-wan—Tsuburi-ko	33°22′	132°24′	3,000	60 to 180	30 to 120	1 quay 1 quay	No data 30	At Nagahaya village; at Asadatsu (Tsuburi or Mikame) village.
17. Sukomo	32°55′	132°45′	600	No data	9 to 48	1 pier	9	—
18. Shimizu	32°14′	132°57′	900	42 to 48	22 to 60	1 quay	No data	2 piers project to 18′ of water

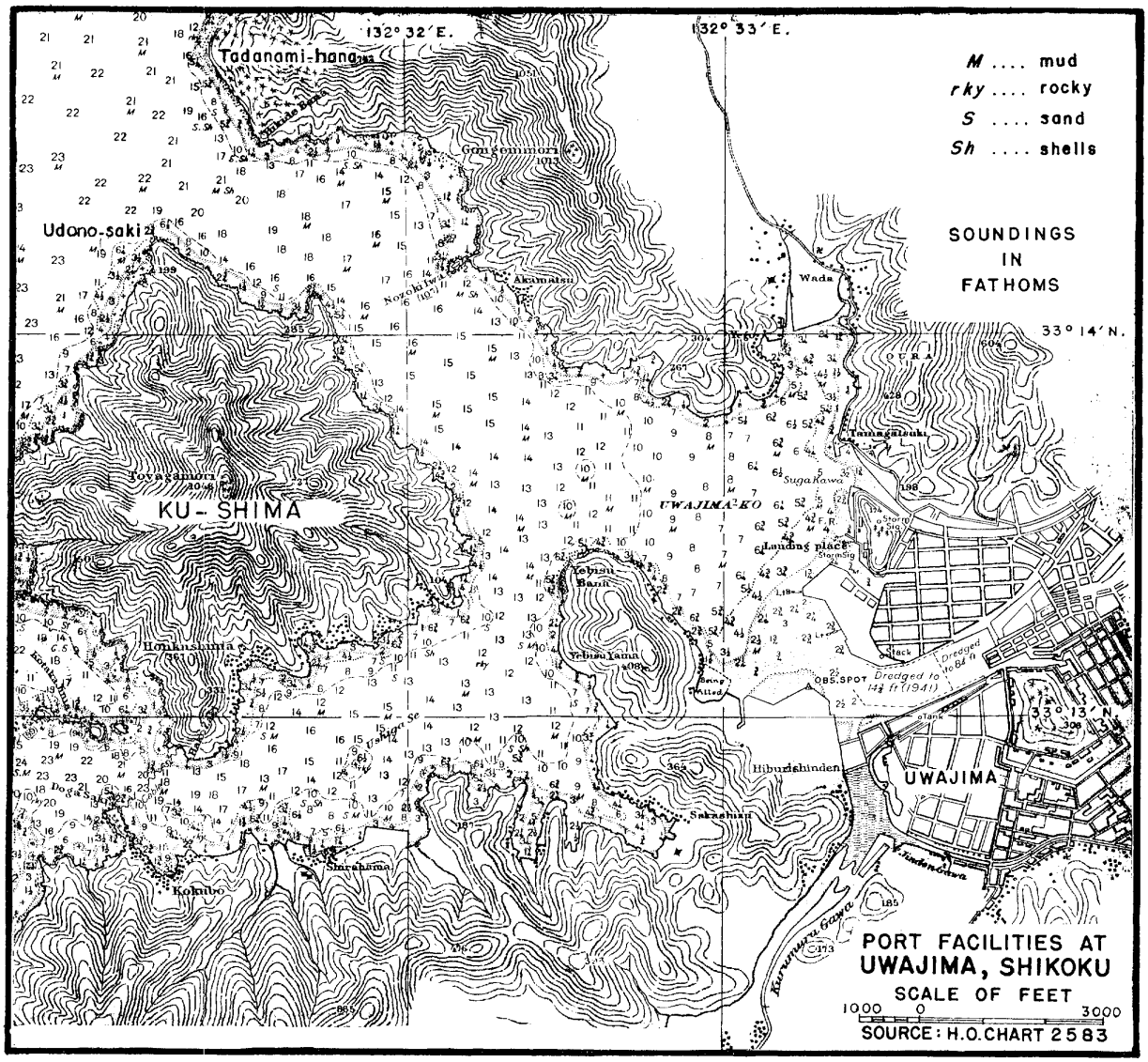

FIGURE VI - 65. *Uwajima.*
Map of harbor.

63. *Southwest Honshū*

There are 10 principal ports, 17 secondary ports, and 36 other landings on southwest Honshū. Of the 10 principal ports, Shimonoseki-Moji, Kōbe, and Ōsaka are the most important. Kure, a closed naval port, is described in Chapter XIII, Topic 133, D.

Shimonoseki and Moji are separated by the narrow strait, Shimonoseki-kaiko, the western entrance to Japan's Inland Sea. Shimonoseki, on the southern tip of Honshū, and Moji, on the northern tip of Kyūshū, are considered as a single port. Together with the Kyūshū Island ports of Wakamatsu-Yawata-Kokura area, Shimonoseki-Moji constitutes one of the important transportation and industrial centers of Japan. Shimonoseki-Moji has 15,625 feet of quays and wharves; 8,960 feet have depths of 22 to 33 feet alongside. In addition to the deep-water facilities, a number of small jetties, piers, ferry landings, slipways, and thousands of feet of quayed wharfage are scattered around the harbor for use by coastal vessels, lighters, and other small craft.

The 3 principal ports, Kōbe, Ōsaka, and the smaller Amagasaki, are at the head of Ōsaka-wan, the eastern end of the Inland Sea. These ports handle the ocean traffic for the industrial heart of Japan, the Ōsaka-Kōbe-Kyōtō triangle.

The most important port and the sixth largest city of Japan, Kōbe has a big artificial inner harbor which can accommodate many large vessels; outside the inner harbor breakwaters, there is unlimited anchorage for all types of ships. Mooring buoys in the inner harbor accommodated 20,000-ton vessels with lengths up to 700 feet. As a result of extensive harbor improvements in progress since 1906 and intensified since 1935, there are 147 vessel berths at the main piers, wharves, and quays at Kōbe; 13 of the berths can handle 600-foot vessels drawing 30 feet of water and 32 additional berths can handle vessels drawing 25 feet or more.

Ōsaka, the third largest port of Japan, also can accommodate ships up to 20,000 tons. Many of the city's industrial plants are on the banks of 3 rivers and a network of interconnecting canals which are used to clear cargo between the harbor and the industrial plants. Thirty-eight vessel berths are available at the piers, wharves, and quays; 2 berths can handle 600-foot vessels drawing 30 feet and 16 berths can handle vessels drawing 26 feet. Both Ōsaka and Kōbe have extensive mechanical cargo handling facilities; transit shed, warehouse, and open storage space; water, coal, oil, gasoline, and other supply facilities; and repair facilities.

Other principal ports on southwest Honshū are: Tsuruga, center of import trade with ports of Korea, Manchuria, and Vladivostok, with 11 vessel berths in 18 to 29 feet of water; Miyazu which has 35 first-class anchorage berths and several quays with 24 to 30 feet of water alongside; Sakai with 20 first-class anchorage berths and several quays for handling coastwise shipping; Hagi, a lumber port, which has good anchorage but only relatively minor landing facilities; Yokkaichi; and Nagoya, an aircraft production center, which has nearby anchorage that can accommodate an entire fleet but has only 5 main piers and quays.

Of the secondary ports, Ube, Kadamatsu, Murorsu-Kaimonoseki, Hiroshima, Itosaki, Habu, Onomichi, Uno, Ō, and Shimotsu are on the Inland Sea and primarily handle coastal traffic. Habu, Onomichi, and Uno are shipbuilding and repair centers. Uno, with its adjacent Tama shipyards, and Hibi are often considered parts of the city of Tamano, southward from Okayama. Maizuru is both a naval and commercial port. Kudamatsu is a short distance eastward from the Tokuyama Minor Naval Station.

Principal and secondary ports and other landings are discussed in this topic in order of their geographical location, moving counterclockwise around southwest Honshū; principal ports start with Tsuruga on the northwest coast of Honshū; secondary ports start with Maizuru on the western coast of Honshū; and other landings start with Obama-Nishizu, near Tsuruga.

A. Principal ports.

(1) Tsuruga (35° 39′ N, 136° 05′ E).

Tsuruga, at the head of Tsuruga-wan on the northwest coast of Honshū, is a port primarily handling import trade with Korea, Manchuria, and Vladivostok. Anchorage sheltered from all but northerly winds and seas is available for all size vessels. Eleven vessel berths are provided by 3,800 feet of inner harbor quays with 18 to 29 feet of water alongside.

(a) Harbor. Tsuruga-kō, an improved natural harbor at the head of Tsuruga-wan, is sheltered from all except northern winds and seas (FIGURE VI - 66). The harbor limits are established by a line drawn from Aka-saki, a point just northwestward from the village of Akasaki, on the eastern side of the bay, to Ko-saki, a point projecting from the western side of the bay. From the western extremity of Kanega-saki, a promontory at the eastern side of the town, a mole and breakwater extension have been constructed, extending west-southwestward for about 2,700 feet. Another breakwater extends northward from the western side of the mouth of the Shōno-gawa, which enters the bay at the western edge of the town, to a point about 900 feet south-southeastward of the head of the above-mentioned breakwater.

The enclosed inner harbor area is about 800 yards long and 500 yards wide. Depths in the entrance are 7 fathoms and the prevailing depths inside are 24 feet, except for the small triangular boat basin in the eastern end where the depths are 5 to 14 feet. It is reported that during the winter strong northwesterly winds sometimes send a swell into the inner harbor, necessitating the use of offshore anchors by vessels moored at the wharves.

The 3,000-acre outer harbor has general depths from 12 to 16 fathoms at the entrance, decreasing to about 5 fathoms at the head.

1. ENTRANCE CHANNEL. Tsuruga-wan, open to the northward, is about 3 miles wide at the entrance between Tateishi-saki and Oka-saki, the western and eastern entrance points respectively, narrowing to about 2 miles in width inside. It indents the coast in a north – south direction for about 6 miles. The northerly gales of autumn and winter send in a considerable swell, but the ranges of high hills surrounding it provide shelter and protection from winds from other quadrants. The western shore consists of rocky cliffs interspersed with shingle and gravel beaches; in general this part of the bay is unobstructed and deep. The eastern shore is more rocky and for the most part is shoal for a considerable distance offshore. The depths in the outer entrance are about 22 fathoms, decreasing to about 16 fathoms at the harbor limits. The 10-fathom contour lies about 250 yards offshore on the western side and ¼ to ½ mile on the eastern side.

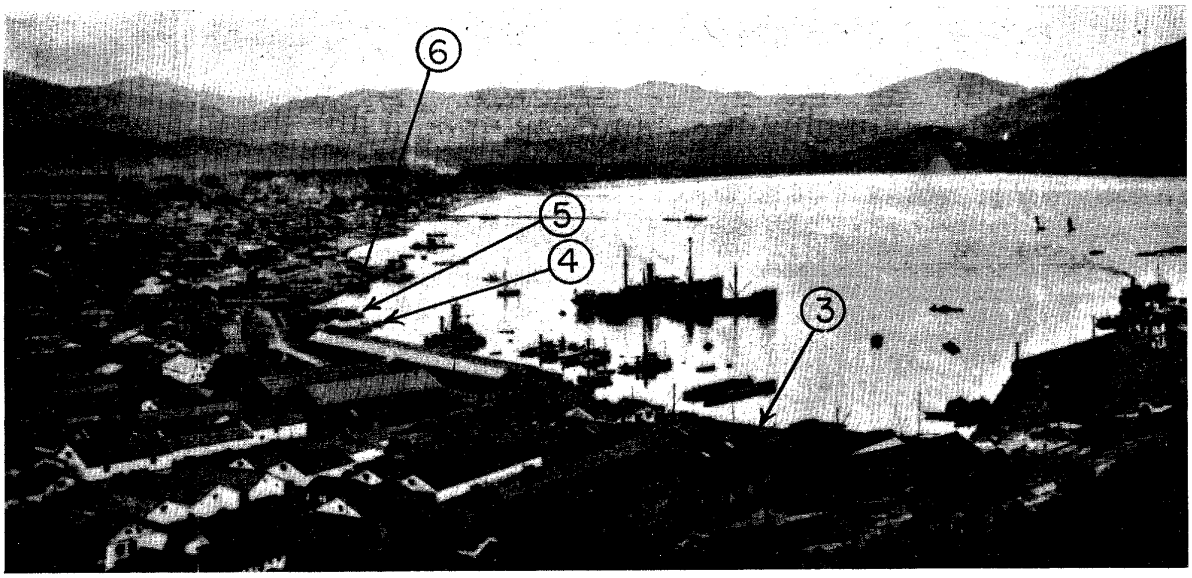

FIGURE VI - 67. *Tsuruga.*
Waterfront, looking west-southwestward. About 1931. Encircled numbers are references to FIGURE VI - 66. Town quay (Reference ⑥) apparently had been extended (FIGURE VI - 69).

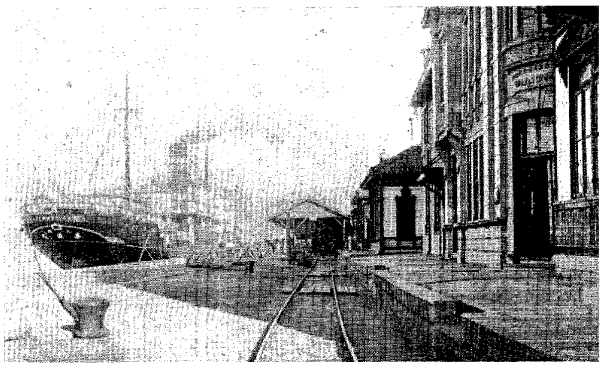

FIGURE VI - 68. *Tsuruga.*
Railroad wharf (Reference ①), looking westward.

2. ANCHORAGE. Urasoko-wan, an inlet in the northern part of the western shore of Tsuruga-wan, indents more than a mile in a northwesterly direction, and ranges from 400 to 600 yards in width. Its depths are 13 fathoms at the entrance, decreasing to about 5 fathoms at the head. It provides sheltered anchorage for medium-sized craft during northerly winds but is exposed to those from the south.

Tsuruga-wan provides sheltered anchorage for vessels of all sizes, protected from all but northerly winds and seas by the high surrounding hills.

Tsurugo-kō provides anchorage in the outer harbor in a 1 mile area in depths from 6 to 16 fathoms, mud bottom. Vessels should keep at least 600 yards off the shore at the head of the bay. Jogū-wan, an indentation in the western shore of the harbor southward from Ko-saki, provides good shelter from northerly winds, and anchorage in depths of from 10 to 12 fathoms, over mud, good holding ground. Care must be taken to avoid fishing nets laid along the shores.

There are about 25 to 30 first-class anchorage berths in the outer harbor of Tsuruga-kō.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. Tides and currents are of no consequence to navigation.

4. LOCAL WEATHER. During autumn and winter, northerly winds prevail; the prevailing winds of spring and summer are southerly. The area is characterized by an absence of easterly winds. Owing to the land configuration, winter gales in the bay are northerly or southerly.

(*b*) *Landing facilities.* Approximately 3,800 linear feet of berthing quays in the inner harbor, with depths of 18 to 29 feet alongside, provide 11 vessel berths (FIGURE VI - 67). In addition 720 linear feet of quays in the eastern boat basin have depths of 5 to 14 feet alongside. Two piers (References ④ and ⑤)* about 50 feet long and 30 feet wide extend from the Customs wharf (Reference ③). Two piers and a quay in Jōgū-wan are 75, 118, and 130 feet long, respectively; depths at the head of the piers are about 8 feet and at the quay about 15 feet. There also are several piers and quays in the bight off Akasaki and Maruyama on the eastern side of the outer harbor. The beach westward of the town is accessible to boats and small craft.

Four mooring buoys for 3,000-ton vessels were located off the wharves of the inner harbor.

The known details of the principal piers and wharves are shown in TABLE VI - 14.

(*c*) *Storage facilities.* Several blocks of old warehouses, about 300 in all, are reported to be in the town, and used for storing fertilizer and miscellaneous goods. The area at the rear of the town quay and small boat basin probably has 6 to 8 acres available as supply dumps. There are railroad and road connections at these sites.

*References are encircled numbers on FIGURE VI - 66.

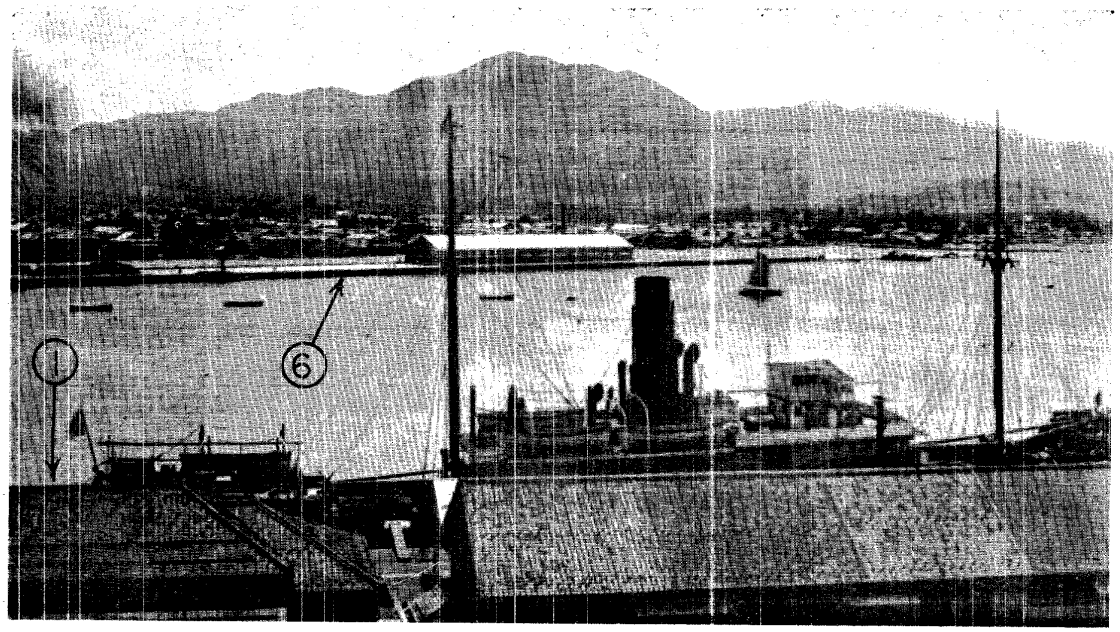

FIGURE VI - 69. *Tsuruga.*
Town quay (Reference ⑥), looking southwestward, taken from near eastern end of railroad wharf (Reference ①).

TABLE VI - 14

PIERS, WHARVES, AND QUAYS AT TSURUGA

Reference on FIGURE VI - 66	①	②	③
NAME	RAILROAD WHARF (FIGURE VI - 68)	BOAT BASIN	CUSTOMS WHARF
Location	NE side of harbor	NE corner of harbor	Westward from boat basin
Owned by	No data	No data	State
Operated by	No data	No data	State
Purpose for which used	General cargo and passengers	Fishing boats and small craft	General cargo and passengers
Type of construction	Believed masonry	Believed masonry	Believed masonry
Description:	Face (ft.)	Face (ft.)	Face (ft.)
Dimensions	1,190	390 + 330	425 + 110 + 115 + 50
Depth of water	29 to 24	14 to 5	18
Berthing space available	1,190	390 + 330	425 + 110 + 115 + 50
Width of apron	Open wharf	Open wharf	20 to 30 feet
Deck above	No data	No data	No data
Capacity per sq. ft. (lbs.)	Unlimited	No data	No data
Lighted or unlighted	No data	No data	No data
Transit sheds:	No data	None	1
Type of construction			No data
Length and width			300′ by 50′
Total floor area			15,000 sq. ft.
Number of floors			1
Height between floors			No data
Allowable floor load per sq. ft. (lbs.)			No data
Lighted or unlighted			No data
Mechanical handling facilities	No data	No data	No data

TABLE VI - 14 *Continued*

PIERS, WHARVES, AND QUAYS AT TSURUGA

Railway connections	600′ of track on quay, 1,000′ at rear.	Trackage at rear of quay probably 1,200′	About 700′ of track at rear of wharf
Water supply	Not available on quay	No data	No data
Estimated terminal capacity	1,500	—	250
Remarks	Two 450-ft. vessels drawing 20′; one 250-ft. vessel drawing 16′ can be berthed.		Piers and an angle break the continuity; one 250-ft. vessel drawing 16′ can be berthed.

Reference on FIGURE VI - 66	④			⑤			⑥
NAME	CUSTOMS PIER (EAST)			CUSTOMS PIER (WEST)			TOWN QUAY (FIGURE VI - 69)
Location on waterfront	Projects from customs quay			Projects from customs quay westward from ④			Westward from customs quay to Shono-gawa
Owned by	State			State			No data
Operated by	State			State			No data
Purpose for which used	Passengers and cargo			Passengers and cargo			General cargo and overseas shipping
Type of construction	No data			No data			Believed masonry
Description:	Face (ft.)	E side (ft.)	W side (ft.)	Face (ft.)	E side (ft.)	W side (ft.)	Face (ft.)
Dimensions	30	50	50	30	50	50	1922
Depth of water	18	18	18	18	18	18	24 to 18
Berthing space available	30	50	50	30	50	50	1922
Width of apron	Open wharf			Open wharf			Open wharf
Deck above	No data			No data			No data
Capacity per sq. ft. (lbs.)	No data			No data			Unlimited
Lighted or unlighted	No data			No data			No data
Transit sheds:	None			None			2
Type of construction							No data
Length and width							200′ by 40′
Total floor area							16,000 sq. ft.
Number of floors							1
Height between floors							No data
Allowable floor load per sq. ft. (lbs.)							No data
Lighted or unlighted							No data
Mechanical handling facilities	No data			No data			No data
Railway connections	None			None			Two lines of tracks on quay total about 3500′
Water supply	No data			No data			No data
Estimated terminal capacity	—			—			1,700
Remarks	—			—			Seven 250-ft. vessels drawing 16′ can be berthed

(*d*) *Capacity and clearance.* The estimated unloading capacity of the port is 3,450 short tons per day.

The wharves are connected with the highway and railroad systems of Honshū. Mail steamers provide communication with Vladivostok, and there is coastal steamer service to Honshū ports.

The total tonnage entering the port in 1931 was 600,000. Seven hundred fifty-three steamships entered the port in 1934 with a registered tonnage of 565,134 tons. Of these, 84 were foreign registered vessels.

(*e*) *Supplies.* There are reported to be 5 water boats at Tsuruga, two of which are equipped with pumps. The maximum

rate of supply is about 30 tons per hour. The source is unknown, but it is reported to be suitable for boiler and drinking purposes. Coal, handled by baskets, is stocked in moderate supply.

(*f*) *Repair facilities.* A 10,000-ton graving dock was reported under construction in 1941.

(2) Miyazu (35° 32′ N, 135° 12′ E).

Miyazu, the northwest coast of Honshu Island in the southwest corner of Wakasa-wan, has 35 first-class anchorage berths and several quays with 24 to 30 feet of water alongside.

(*a*) *Harbor.* Miyazu-wan is an inlet indenting the coast in a south-southwestern direction between Hami-saki and Kuro-saki (FIGURE VI - 70). It is about 5 miles long and from ¾ to 1¼ miles wide, has depths that range from 13 fathoms at the northern end to about 6 fathoms near the head, and is relatively free from dangers. High surrounding hills provide good shelter from all winds.

1. ENTRANCE CHANNEL. The entrance to Miyazu-wan is about 1¼ miles wide.

The western shore is a sandy beach with the 5-fathom contour lying from 250 to 750 yards offshore. At Hioki-saki, about 1.4 miles southwestward from Hami-saki, rocky shoal patches extend about 200 yards eastward.

The eastern shore is for the most part tortuous, with high and cliffy headlands. The shore is indented, with most of the points terminating in cliffs. Between Katashima-hana and Shishi-saki lies Shishi-guri, a rock covered by 2¾ fathoms of water, about 600 yards offshore. A reef extends from this rock in an east-southeasterly direction to the shore.

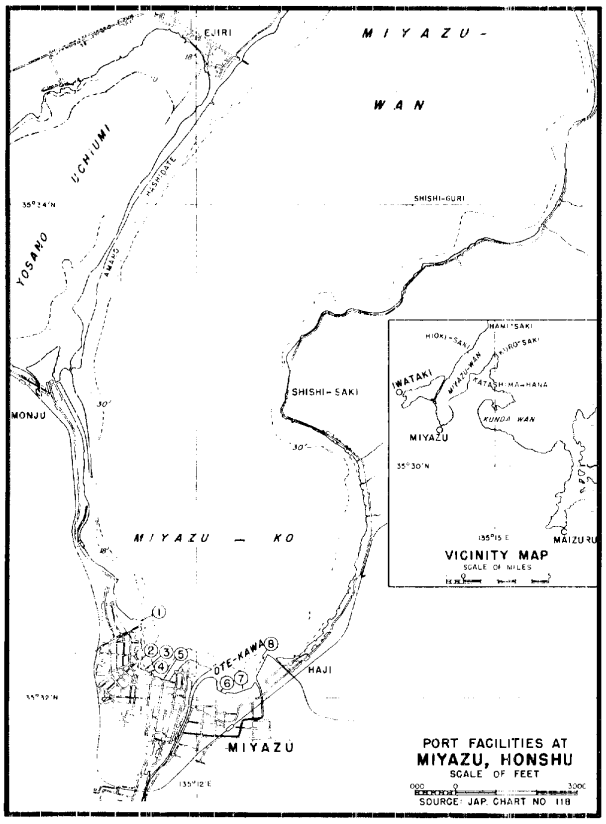

FIGURE VI - 70. *Miyazu.*
Sketch of harbor showing location of port facilities by encircled reference numbers.

2. ANCHORAGE. The best anchorage and holding ground in Miyazu-kō can be found south of a line drawn from Shishi-saki in an east – west direction; except during northerly gales, this section of the harbor is calm. Large vessels anchor in 48 feet, over mud bottom, about 1,000 yards offshore. Smaller vessels anchor closer to the town. There are about 35 first-class berths in the harbor and bay.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The lunitidal interval at Miyazu is 2 hours, 31 minutes; spring rise 1 foot and neaps ½ foot.

In Miyazu-wan the tidal currents are weak and the wind influences them considerably. The flow is in general parallel to the shores, the flood current southwesterly and the ebb setting northeasterly. After the passing of low pressures, northerly ocean currents, with a velocity of about 0.3 knot, may be experienced on the western side of Katashima-hana.

4. LOCAL WEATHER. There is heavy rainfall in July and November; the rainy season in general extends from June to November. The winters are severe with heavy snows. Typhoons may be expected from July to October. Northwest gales, which frequently occur during January to March, are severe and often last 1 to 3 days. They give little notice of their approach and raise a high sea. Prevailing winds during the winter months are north and northwest. There is an average of 3 days of fog at Miyazu annually.

(*b*) *Landing facilities.* The municipal pier (Reference ④)* projects from near the center of the town waterfront. In the bight eastward from the mouth of the Ōte-kawa, there are quays (References ⑥ and ⑦) with deep water alongside. A quay (Reference ⑧), recently constructed to accommodate large vessels, is on the waterfront eastward from the eastern branch of the Ōte-kawa.

Both banks of the Ōte-kawa, below the bridge, are reported to have wharves and landing stages.

A pier is reported northwest of the town, and there are several marginal wharves fronting the harbor in that area. The moderate depths alongside range from 12 to 18 feet.

In addition, there are upwards of 1,000 feet of quays and wharves along the harbor waterfront with depths from 6 to 15 feet. The known details of the principal wharves and piers are shown in TABLE VI - 15.

The villages of Ejiri and Hama are on the western side of Miyazu-kō, northward about 2 and 4 miles respectively from Miyazu. Both have wooden piers projecting from the shore with depths of 6 to 10 feet alongside.

(*c*) *Storage facilities.* It is believed that covered storage for grain and other cargo exists. The rear of the new construction (Reference ⑧) and the adjacent reclaimed land have about 5 acres of open storage. Roads connect these areas to the railroad station and yards.

(*d*) *Capacity and clearance.* The unloading capacity of the port is estimated to be 2,600 short tons per day.

The railroad station of the Miyazu line, which follows the coast and connects to the island system, is located about 300 yards south from the eastern wharves. Roads connect all the wharves and piers with the town, and the island highway system. Miyazu is a port of call for coastal and ocean-going vessels.

*References are encircled numbers on FIGURE VI - 70.

TABLE VI - 15

PIERS, WHARVES, AND QUAYS AT MIYAZU

Reference on FIGURE VI - 70	①	②	③
NAME	NORTHWEST LANDING	WEST WHARF	TOWN QUAY (WESTERN END)
Location on waterfront	Northwestward from town waterfront	Westward from town quay	Fronts town
Purpose for which used	General cargo	General cargo	General cargo
Type of construction	Believed masonry quay	Believed masonry quay	Believed masonry quay
Description:	Face (ft.)	Face (ft.)	Face (ft.)
Dimensions	230	190	260
Depth of water	16	15 to 18	24 to 28
Berthing space available	230	190	260
Width of apron	Open wharf	Open wharf	Open wharf
Deck above low water	No data	No data	No data
Capacity per sq. ft. (lbs.)	No data	No data	No data
Lighted or unlighted	Lighted	No data	No data
Transit sheds:	No data	No data	No data
Mechanical handling facilities	No data	No data	No data
Railway connections	None	None	None
Water supply	No data	No data	No data
Estimated terminal capacity	250	250	250
Remarks	One 200-ft. vessel drawing 12′ can be berthed	One 200-ft. vessel drawing 12′ can be berthed	One 250-ft. vessel drawing 16′ can be berthed

Reference on FIGURE VI - 70	④			⑤	⑥
NAME	MUNICIPAL PIER			TOWN QUAY (EASTERN END)	EASTERN QUAY (WESTERN END)
Location on waterfront	Extends from town waterfront			Town waterfront	Eastward from Ote-kawa
Purpose for which used	General cargo and passengers			General cargo	General cargo
Type of construction	Floating pontoons			Believed masonry quay	Believed masonry quay
Description:	Face (ft.)	W side (ft.)	E side (ft.)	Face (ft.)	Face (ft.)
Dimensions	20±	108	108	460±	260
Depth of water	30	28 to 30	28 to 30	18 to 24	21
Berthing space available	—	108	108	460±	260
Width of apron	Open wharf			Open wharf	Open wharf
Deck above low water	No data			No data	No data
Capacity per sq. ft. (lbs.)	No data			No data	No data
Lighted or unlighted	Lighted			No data	No data
Transit sheds:	1			No data	No data
Type of construction	No data				
Length and width	130′ by 60′±				
Total floor area	7800				
Number of floors	1				
Height between floors	No data				
Allowable load per sq. ft. (lbs.)	No data				
Lighted or unlighted	No data				

TABLE VI - 15 *Continued*

PIERS, WHARVES, AND QUAYS AT MIYAZU

Mechanical handling facilities	No data	No data	No data
Railway connections	None	None	None
Water supply	Water piped on pier	No data	No data
Estimated terminal capacity	—	250	250
Remarks	—	One 250-ft. vessel drawing 16′ can be berthed	One 250-ft. vessel drawing 16′ can be berthed

Reference on FIGURE VI - 70	⑦	⑧
NAME	EASTERN QUAY (EASTERN END)	NORTHEAST WHARF
Location on waterfront	Eastward from Ote-kawa	Northeast from ⑦
Purpose for which used	General cargo, probable military use.	General cargo, probable military use.
Type of construction	Believed masonry quay	Believed masonry quay
Description:	Face (ft.)	Face (ft.)
Dimensions	250 + 400	600
Depth of water	17 to 23	20 to 26.5
Berthing space available	250 + 400	600
Width of apron	Open wharf	Open wharf
Deck above low water	No data	No data
Capacity per sq. ft. (lbs.)	No data	No data
Lighted or unlighted	No data	No data
Transit sheds:	No data	No data
Mechanical handling facilities	No data	No data
Railway connections	None	None
Water supply	No data	No data
Electric current	No data	No data
Estimated terminal capacity	750	600
Remarks	Part of this quay recently constructed; One 350-ft. vessel drawing 20′, and one 200-ft. drawing 12′ can be berthed.	One 450-ft. vessel drawing 20′ can be berthed

(*e*) *Supplies.* Water is piped onto the municipal pier. There are no local boats for transporting it to vessels anchored in the harbor. A large electric power plant is just south of the new northeast wharf and adjoining the railroad.

(3) Sakai (35° 33′ N, 133° 14′ E).

Sakai, at the western end of Miho-wan on the northwest coast of Honshū, has 20 first-, and 20 second-class anchorage berths and several quays for the handling of coastwise shipping.

(*a*) *Harbor.* The harbor, a natural roadstead with artificial protection and improvement, is in the Nakaeno-seto, a passage joining Miho-wan to Nakami, a lagoon westward from the city (FIGURE VI - 71). A breakwater extends in an easterly direction from a point just southward of Odaiba-hana, for about 1½ miles. The inner harbor is subject to silting; the depths are maintained by dredging. It is reported that the present depths are about 3 feet less than the charted depths of about 4 fathoms at the eastern and western entrances, and a prevailing least depth of 3¼ fathoms in the channel. The harbor is well sheltered and protected from all winds and seas.

1. ENTRANCE CHANNEL. The eastern and main entrance to the inner harbor is through the channel formed by the breakwater. Lights and range beacons marked the channel which in general is about 150 yards wide.

2. ANCHORAGE. There are probably 20 first-class and 20 second-class berths available for anchorage in the outer harbor southward from the breakwater light, in depths of 3½ to 6 fathoms over mud and sand.

There is also anchorage for small craft, with local knowledge, in Mihonoseki, a small cove eastward from the entrance to Sakai-kō, in depths of 3½ to 6 fathoms. A southerly wind sends a swell into the cove.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. Vertical tidal movements are of no consequence to navigation.

The tidal current flows into Sakai-kō from about 3 hours after low water until about 3 hours after high water, and flows outward from then until about 3 hours after low water. The outward current following higher high water, and the inward current following lower low water may attain a velocity of 2 knots, but at other times the velocity rarely exceeds 1 knot.

4. LOCAL WEATHER. In the Miho-wan district, the winds are comparatively steady, sometimes blowing from one

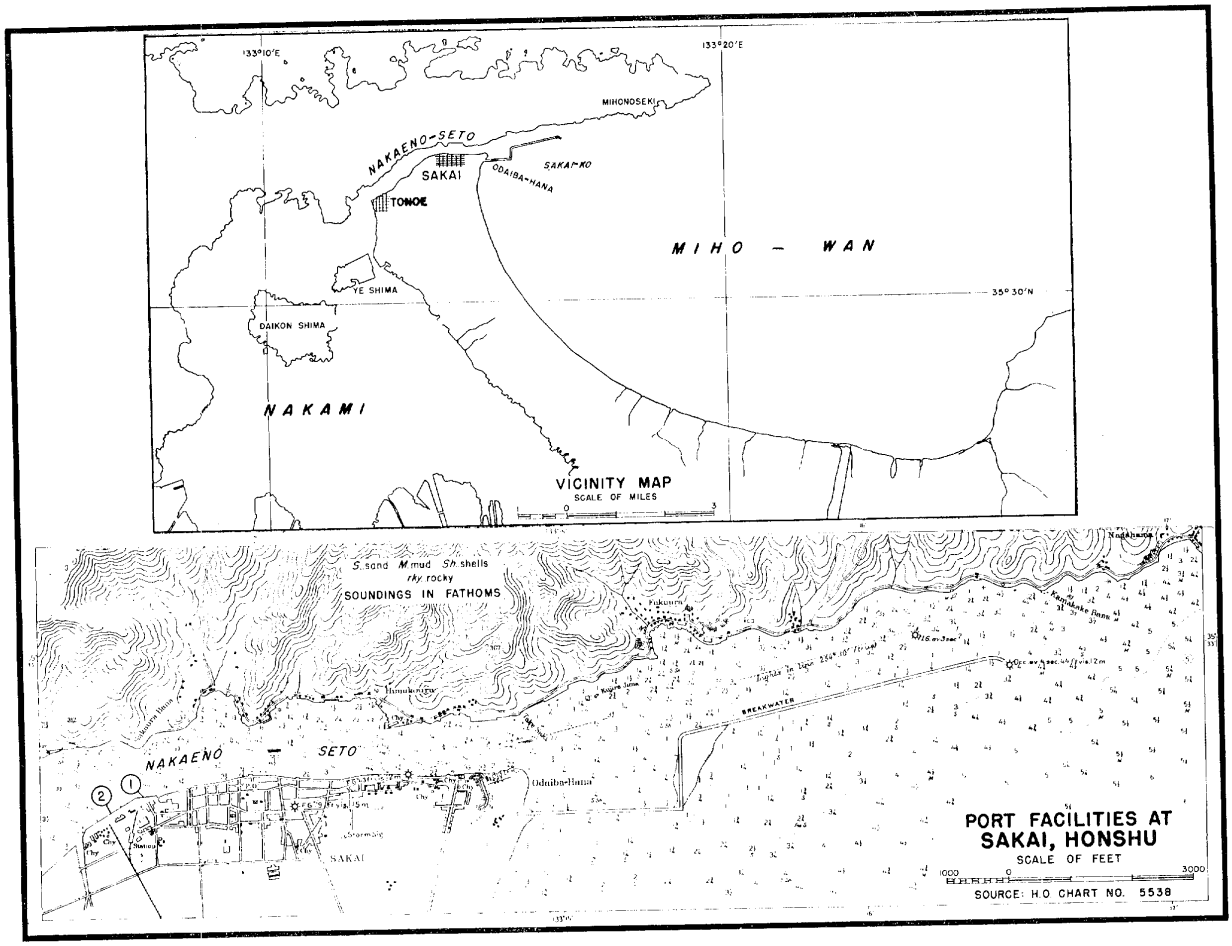

FIGURE VI - 71. *Sakai.*
Map of harbor showing location of port facilities by encircled reference numbers.

direction for 2 or 3 weeks at a time. Northwesterly winds are strongest and most frequent in winter, but cease in April. Light southerly winds prevail in summer, gradually changing to easterly in late August, then to northerly with the coming of bad weather in October. At Sakai the August and January mean temperatures are 79° and 40°, representing the maximum and minimum for the year.

(*b*) *Landing facilities.* Two quays, with lengths of 320 and 980 feet, respectively, are opposite the railroad station at Saki. Known details of the quays are shown in TABLE VI - 16.

Several small piers varying in length from 10 to 20 feet, with depths at their head of from 6 to 14 feet, are located eastward from the berthing quays. There are believed to be several quays and shore wharves along the northern side of the harbor, especially at Fukuura and Himukouru. The depths alongside, however, do not exceed 6 to 10 feet.

Mihonoseki-ko, a fishing harbor in which several small vessels can anchor, is about 2 miles eastward from the breakwater head at Sakai. It is backed by hills and has a water area of about 18 acres. The depths range from 6 fathoms at the entrance to 3¼ fathoms at the head of the cove. A small jetty projects from a quay about 300 feet long on the eastern side. A breakwater extends eastward from the western entrance point. A ferry operated between Sakai and Mihonoseki.

(*c*) *Storage facilities.* There are probably about 5 acres of open storage space at the rear of the wharves, served by both railroad and highway.

(*d*) *Capacity and clearance.* The estimated unloading capacity of the port is 1,080 short tons per day.

The railroad line, which serves the port, connects with the State Railways of Honshū at Yonago. Highways lead to Yonago, Matsuye, and other coastal points.

In 1934, a total of 49,667 vessels, of which 19 were of foreign registry, entered the port. Their total tonnage was 877,731 tons.

(*e*) *Supplies.* Two small water boats are available; they can supply water at the rate of about 250 tons per day. The boats were equipped with pumps. Fuel oil, believed to be Diesel, is available from 2 tankers equipped with motor pumps and another boat equipped with a hand pump. The fueling capacity is about 30 tons per hour. Several oil tanks are reported located on reclaimed land at the western end of the town.

(*f*) *Repair facilities.* There are 4 marine railways located here, operated by Ishibashi Zosensho. Two have capacities of 200 tons each, one 250 tons, and one 300 tons.

TABLE VI - 16

QUAYS AT SAKAI

Reference on FIGURE VI - 71	①	②
NAME	TOWN QUAY, EASTERN PART	TOWN QUAY, WESTERN PART
Location on waterfront	N of railroad station	NW of railroad station and west of ①
Owned and operated by	No data	No data
Purpose for which used	General cargo and passengers, coastal shipping.	General cargo and passengers, overseas shipping.
Type of construction	Believed masonry	Believed masonry
Description:	Face (ft.)	Face (ft.)
Dimensions	320	980
Depth of water	17.5	20-21
Berthing space available	320	980
Width of apron	Open wharf	Open wharf
Transit sheds	No data	No data
Mechanical handling facilities	No data	No data
Railway connections	Spur track dead-ends at rear of quay	Tracks dead-ends at rear of quay
Water supply	No data	No data
Electric current	No data	No data
Estimated cargo capacity, short tons	240	840
Remarks	One 250-ft. ship drawing 16′ can be berthed	One 350-ft. ship drawing 20′ and two 250-ft. ships drawing 16′ can be berthed

(4) Hagi (34° 25′ N, 131° 24′ E).

Hagi, on the northwest coast of Honshu Island, is a lumber port with 8 first-, and 10 second-class anchorage berths. The city, in the southern part of the harbor, has only minor landing facilities; the main wharves, including one having 24 feet of water alongside, are in Kata-kō, about 1 mile northward.

(*a*) *Harbor.* Hagi-kō, a small bay, is about 1.7 miles wide at the entrance between Ōse-hana and Koshigahama-hanto and indents the coast about 1 mile (FIGURE VI - 72). Open to the westward, it provides protection except during northwesterly winds. The depths range from 13 fathoms in the entrance to an average of about 8 to 10 fathoms in the middle. The inner harbor, a natural inlet in the northern part of the bay, is known as Kata-kō. It is nearly ½ mile long and about 300 yards wide, with depths of 8 to 4¼ fathoms. Small craft can enter the river harbor in the mouth of the Matsumoto-kawa. These craft enter the river mouth directly during the summer, but for the rest of the year entrance is through the canal from Nakaobata-ura. The depths are shallow.

1. ENTRANCE CHANNEL. The main entrance between Ōse-hana and Koshigahama-hantō is wide, deep, and free from all obstructions and dangers, except for a shoal area off the southwestern end of Koshigahama-hantō. The 10-fathom contour lies from 300 to 600 yards off the shores and enters the bay for about two-thirds of its length. The entrance to Kata-kō through Obata-ura is about 500 yards wide, has depths of 8 fathoms, and is clear and free from obstructions.

2. ANCHORAGE. The anchorage for large vessels is in a depth of about 10 fathoms, mud bottom, with Kasa Yama bearing 352° and Shizuki Yama bearing 229°. Small vessels can anchor in Nakaobata-ura or Obata-ura; the latter has depths of 6 to 8 fathoms. There are about 8 first-class and about 10 second- and third-class anchorages in Hagi-ko and the inlets.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The lunitidal interval at Hagi-kō is 10 hours 52 minutes; springs rise 2¼ feet, neaps 2 feet, and the mean tide level is 1½ feet.

4. LOCAL WEATHER. In the winter the northwest winds are prevalent, but southerly winds may be expected. In the summer the southeast to southwest winds are mostly prevalent. The annual precipitation varies from 64 to 100 inches with the lesser volume falling near Hagi. June, July, and September are the rainiest months. The plum rains fall in early summer and the typhoon rains in September.

(*b*) *Landing facilities.* The only deep water wharf in the harbor is in Kata-kō. It is a quay about 520 feet long, with depths alongside of 24 feet, divided in 2 sections: one about 350 feet long; the other about 170 feet long. The latter is set back about 15 feet. These wharves provide 1 berth for ocean-going vessels.

Eastward from this wharf there is a quay or sea wall about 600 feet long with shallow depths alongside. Along its rear are several sheds.

The charts show about 1,740 linear feet of quays along the southwest bank of the Matsumoto-kawa between its mouth and the first bridge, with depths alongside ranging from 7.5 feet at the outer end to 2.5 feet at the inner end. These quays are accessible to small craft only; the depths in the canal channel from Nakaobata-ura are about 6 feet.

(*c*) *Storage facilities.* Eastward from the Kata-kō wharf there are several buildings along the road and railroad tracks. The area at the rear of the Kata-kō wharf and eastward from it has about 1 acre of open storage space. The eastern shore of

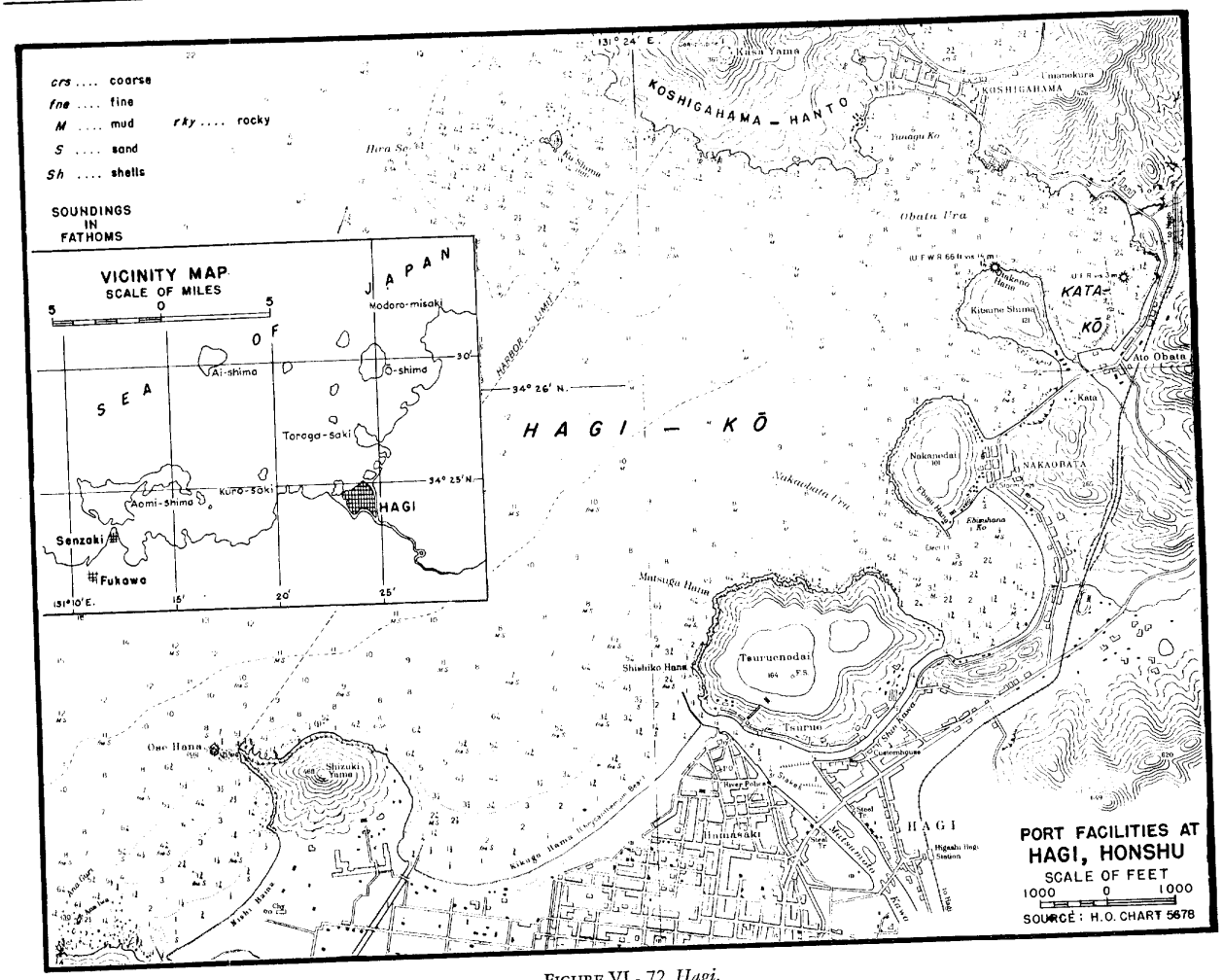

FIGURE VI - 72. *Hagi.*
Map of harbor showing location of port facilities.

Nakaobata-ura, fronting the village of Nakaobata, would probably provide beach landing space, with a number of buildings at the rear. A cultivated field on the eastern side of the Matsumoto-kawa, and through which the railroad passes, has ample area for open storage with both road and rail service.

(*d*) *Capacity and clearance.* The estimated unloading capacity is 400 short tons per day.

Roads that serve all the wharves, and a railroad near the wharves of Kata-ko, connect with the highway and railroad systems of Honshū.

In 1934, ninety steamships, 33 of foreign registry, entered the port; total tonnage was 122,526 tons.

(*e*) *Supplies.* Water is piped onto the wharf at Kata-kō, a plentiful supply of good quality can be secured from the Matsumoto-kawa, about 3 miles upstream.

(5) Shimonoseki-Moji (33° 57′ N, 130° 57′ E).

Shimonoseki is on the southern tip of Honshū; Moji is on the northern tip of Kyūshū. They are separated by the narrow strait, Shimonoseki-kaikō, the western entrance to Japan's Inland Sea, but will be treated as a single port. Both are connected by ferries and a railroad tunnel (FIGURE VIII - 110)*. Together with the Kyushu ports of the Wakamatsu-Yawata-Kokura area (Topic 61, A, (1)), which are on Shimonoseki-kaiko, to the southwestward, Shimonoseki and Moji constitute one of the most important transportation and industrial regions in Japan (FIGURE VI - 1). Kammon-kō, the harbor at Shimonoseki-Moji, is the focal point of Japanese imports from China, Korea, and Manchuria.

Classed as a typhoon anchorage, ocean-going steamers anchor off Moji in a 250-acre water area in depths from 21 to 30 feet. The principal landing facilities include approximately 15,625 feet of quays and wharves; 8,960 feet have depths of 22 to 33 feet alongside and the remainder have depths of 12 to 22 feet to take care of coastal steamers and small freighters. An additional 12,800 feet of shallow water berths are available in depths of 6 to 12 feet to handle small craft, lighters, and barges. A number of small jetties, piers, ferry landings, and slipways are scattered throughout the harbor and an adequate number of lighters and tugs are based at the 2 ports. Coal, oil, storage, and repair facilities also are available.

(*a*) *Harbor.* The area between Shimonoseki, Moji, and the northeastern part of Hiko-shima, forms a natural roadstead and harbor in the Shimonoseki-kaikyo (strait), the western en-

*Town plan of Shimonoseki-Moji, Chapter VIII.

trance to the Inland Sea (FIGURE VI - 73). The strait lies between Honshū and Kyūshū, with Hiko-shima on the northwestern side.

The entire strait is about 15 miles long but the section covered here is about 6 miles long. At its narrowest part, it is slightly more than 400 yards wide; other widths vary from about 700 yards to 1 mile. Both eastern and western outer approaches are obstructed by numerous rocky shoals and sand banks. The eastern approach, about 2 miles wide, is divided by banks into 3 channels; the northernmost is the deepest. The least depth in the eastern approach is 4½ fathoms; in the remainder of the strait a least depth of 5½ fathoms prevails. Considerable dredging and reclamation work is underway to provide a minimum depth of 36 feet in the harbor channel. The depths in the small bay off Moji are 5 to 6 fathoms. Southwestward and off Shiroki-saki, the depths are 6½ to 8 fathoms. The depths in the bay off Shimonoseki are 4 to 8 fathoms, shoaling toward Okino-su.

The area between Shimonoseki and Hiko-shima also is being dredged and reclaimed. A roughly triangular island is being formed on the western part of Okino-su, a drying flat occupying a considerable area in the harbor; a channel is being dredged between this reclaimed area and Hiko-shima proper. This channel has depths of 10½ and 18 feet. A causeway with a canal lock joins the north and south sides of this channel, giving small craft access to the main harbor and the strait from Ko-seto, which separates Honshu from Hiko-shima. The original channel to Ko-seto has been closed in the reclamation work.

The hills and plateaus surrounding the 1,730-acre harbor area do not exceed 325 feet, but give good protection against winds. The strait is usually congested with shipping including sailing vessels and tows, making it difficult to navigate.

1. ENTRANCE CHANNEL. The eastern entrance, known as the Hayatomo-seto, is that section of the strait between Moji-saki and Dannouracho. It is slightly more than 400 yards wide and has depths ranging from 5¼ to 13 fathoms. The western entrance, known as O-seto, is that section of the strait between Dairi and Tanokubi. It is about ¾ mile wide and has depths of 5½ to 8 fathoms. Numerous cables are laid across the channel in this vicinity.

2. ANCHORAGE. Most ocean-going steamers anchor off Moji, where there is an anchorage area of about 250 acres, in depths of 21 to 30 feet, over sand or hard clay. The area provides 10 to 12 second-class berths. There were 10 mooring buoys located in the area. Anchorage may be found off Shimonoseki well southward from the customhouse, in depths of 6 to 7 fathoms over sand or clay; care must be taken to avoid the bank in the bight which was marked by buoys. The current sometimes causes vessels to drag anchors in this area. Several mooring buoys were located in the area between Enoura and Ganryū-shima.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water tidal interval varies in the strait from 8 hours 51 minutes at He-saki in the eastern approach, to 9 hours 22 minutes at Tanokubi at the southern end of Hiko-shima. The high water springs range from 12¼ feet to 5½ feet at the same points respectively, with heights of 7½ and 7¼ feet at Moji and Shimonoseki respectively. The mean tide level is 4.3 feet at Moji and Shimonoseki, and 3.3 feet at Tanokubi.

The tidal currents attain their greatest strength in Hayatomo-seto. The west flowing current flows at greatest velocity when it is high water along the shore at Dannouracho on the northern shore of the strait, and the east flowing current is strongest during low water at the same place.

The maximum velocity is about 7 knots, with the currents weakest during a period about halfway between high and low water. In the narrows of Hayatomo-seto, the eastern flowing current sets nearly to the northeast toward the shore of Dannouracho and attains a maximum velocity about 200 yards offshore in the vicinity of the Hino-yamashita traffic warning signal station. The westward flowing current in the narrows sets nearly to the southwest toward the shore of Shimonoseki, attaining its greatest strength about 200 yards offshore in the vicinity of the Shimonoseki range lights.

During both east- and west-flowing currents, eddies are formed on the edges of the less advanced currents at Moji-saki, and subsequent to the maximum strength of the main current, these eddies increase in both strength and area. During the period when the currents are flowing easterly, vessels should avoid entering the area of the eddies on the eastern side of Moji-saki; during the period when the current is flowing west, vessels entering Moji harbor should use caution because of eddies within the harbor area.

The change in the middle of Ō-seto is about 10 minutes later than that in Hayatomo-seto. The maximum velocity in Ō-seto is attained in the vicinity of the fairway eastward of Yamazo-kono-hana, the rate being about ¾ of the maximum in Hayatomo-seto.

4. LOCAL WEATHER. In Shimonoseki-kaikyō, easterly winds prevail throughout the year, with northwesterly winds less frequent. At night, and up to about 9:00 a. m., the winds are easterly shifting thereafter to westward. In fair weather this phenomenon prevails regularly constituting the land and sea breezes of the district.

From February to July, there is considerbale fog in the strait during periods of calm weather. Fogs are rarely seen when the wind has a velocity in excess of 5 knots. The time of development of the fog is mainly around sunrise, dispersing as the sun rises.

In the western part of the strait, a smoky haze is encountered during easterly winds, but with a change in wind the visibility is good. During seasonable weather the morning visibility is usually poor in comparison to that of the afternoon, particularly on calm days.

At Shimonoseki the mean annual wind velocity is 9½ knots, with a velocity of 8 knots in October, 10 to 11 knots in January to March, and velocities of 19 knots and over occurring on a third of the days in winter.

The mean annual temperature at Shimonoseki is 59°, the maximum 97°, and the minimum 20°. The mean annual rainfall is 64 inches falling in 163 days of the year. The mean relative humidity is 76 per cent.

(*b*) *Landing facilities.* There are approximately 15,625 linear feet of quays and wharves in the harbor; 8,960 linear feet are deep water wharves with depths of 22 to 33 feet alongside; and 6,665 linear feet are coastal and small freighter wharves with 12 to 22 feet alongside. These do not include a substantial amount of wharf space for small craft, lighters, and barges.

The foreign trade zone pier (Reference ①)* has berths for 6 coastwise ships drawing from 12 to 16 feet (FIGURES VI - 74 and VI - 75), but the chart shows work in progress that

*References are encircled numbers on Figure VI - 73.

might provide berths for larger ships. Another quay used in foreign trade (Reference ③) extends southwestward from the south end of Moji (FIGURE VI - 76). It has 7 berths for ships from 450 to 550 feet long that draw from 26 to 33 feet and can care for 25,000-ton vessels. The chart shows warehouses at 4 of the berths; proposed buildings at 2 other berths; and 4 proposed warehouses across the railroad tracks from the other buildings. The coal and oil piers (Reference ⑯) south of Deshimachi, have berths for four 200-foot vessels and other space suitable only for barges. Large ships transfer oil by floating pipelines extending to mooring buoys. Ten mooring buoys were located in the Moji section of the harbor for use by ships transferring cargo by lighter. Known details of the principal piers, wharves, and quays are described in TABLE VI - 17.

In addition to the quays for ocean-going and coastwise ships listed in TABLE VI - 17, there are about 12,800 linear feet of shallow water berths, with depths of 6 to 12 feet alongside, accessible to small craft, lighters, and barges only. A number of small jetties, piers, ferry landings, and slipways are scattered throughout the harbor. Six boat basins provide shelter for fishing craft. The best known of these landings are listed in TABLE VI - 18.

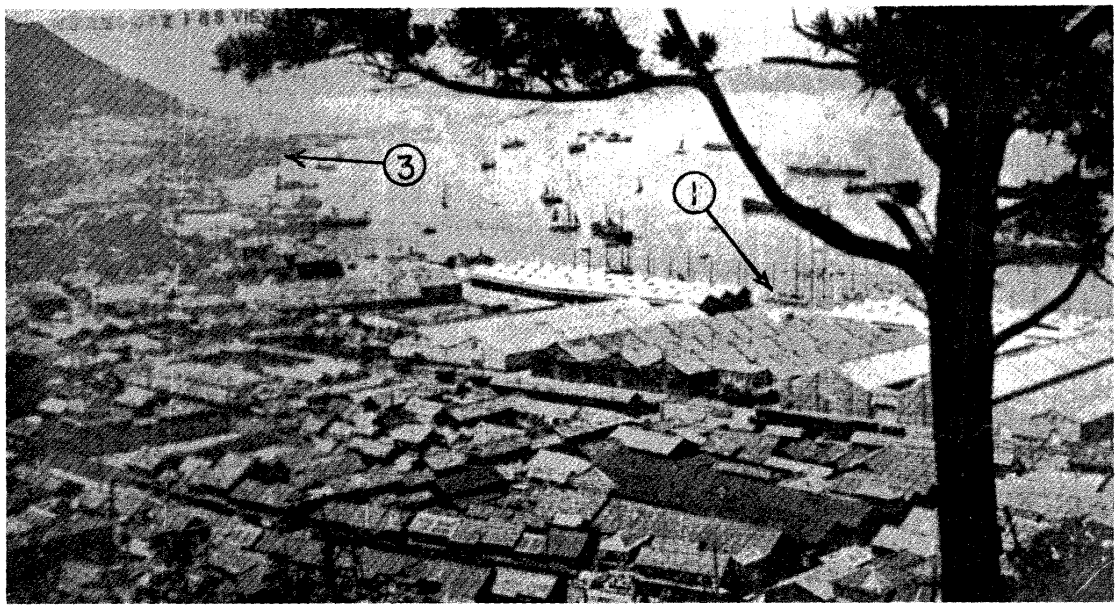

FIGURE VI - 74. *Shimonoseki-Moji.*
Moji waterfront, looking southwestward across foreign trade zone wharf (Reference ①). Moji wharves (Reference ③) in left background.

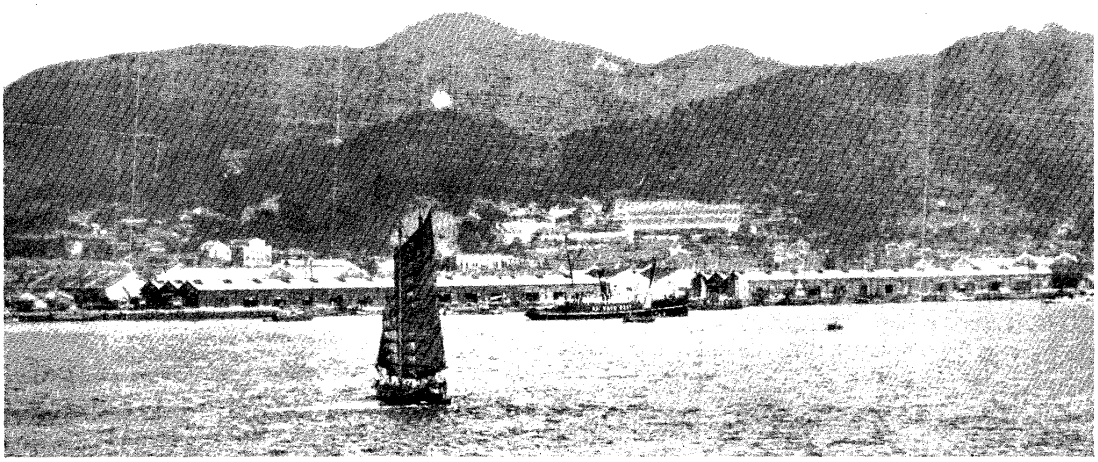

FIGURE VI - 75. *Shimonoseki-Moji.*
Foreign trade zone wharf (Reference ①), looking southeastward.

In addition to the cranage listed in TABLES VI - 17 and VI - 18, there are 3 cranes at the Mitsubishi shipyards at Enoura with 3, 5, and 20 tons capacity respectively. At the Osaka Iron Works yard there is a hammerhead crane with a lifting capacity of 30 tons. Also available are 1 floating shear-leg of 20 tons capacity and 1 derrick crane on a pontoon float with a capacity of 40 tons.

Hundreds of lighters and numerous tugs are reported available. Among them are: one 130-ton tug, 2 smaller tugs, four 200-ton lighters, and several smaller lighters at Shimonoseki; and 2 tugs of 175 and 230 tons respectively at Moji. These are used to berth ships at the customs and foreign trade zone. There are 8 waterboats of 50 to 140 tons capacity at Moji, and 14 waterboats, capacities unknown, at Shimonoseki. The Mitsui interests have two 65-ton oil tankers.

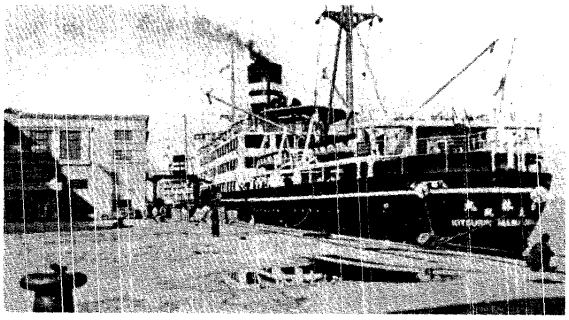

FIGURE VI - 76. *Shimonoseki-Moji.*
Moji wharves (Reference ③), looking southwestward.

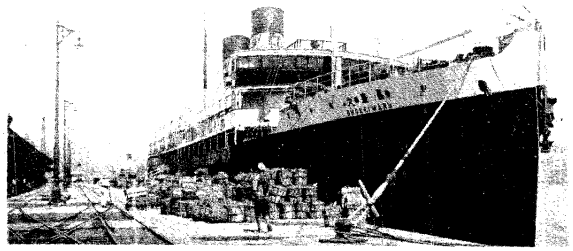

FIGURE VI - 77. *Shimonoseki-Moji.*
Fusan Kaisha Wharf (Reference ⑨), looking eastward.

TABLE VI - 17

PIERS, WHARVES, AND QUAYS AT SHIMONOSEKI-MOJI

Reference on FIGURE VI - 73	①	②	
NAME	FOREIGN TRADE ZONE (FIGURES VI - 74 AND VI - 75)	CUSTOMS PIER	
Location on waterfront	N Part of Moji waterfront	Extends out from S end Reference ①	
Purpose for which used	General cargo	Customs landing; goods and passengers.	
Type of construction	Masonry quay	Believed timber deck on piling, T-head.	
Description:	Face (ft.)	Face (ft.)	Approach (ft.)
Dimensions	1,750	75	75 by 20
Depth of water	15 to 22	16	--
Berthing space available	1,750	75	--
Width of apron	40	20	
Capacity per sq. ft. (lbs.)	Unlimited	No data	
Lighted or unlighted	Lighted	Lighted	
Transit sheds:	1	None	
Length and width	530' by 100'		
Total floor area	53,000 sq. ft.		
Number of floors	1		
Height between floors	18'		
Lighted or unlighted	Lighted		
Mechanical handling facilities	1 fixed hand-operated crane, 5 tons capacity; 1 railroad crane, 1½ tons.	Small cranes.	
Railway connections	1,200 linear feet of tracks on quay; additional trackage in rear.	Tracks on wharf at root of pier.	
Water supply	No data	No data	
Electric current	No data	No data	
Estimated terminal capacity	1,440	--	
Remarks	Berthage: five 200-ft. boats drawing 12'; one 250-ft. boat drawing 16'.	Berthage: 1 passenger or freight boat drawing up to 16'.	

TABLE VI - 17 *Continued*

PIERS, WHARVES, AND QUAYS AT SHIMONOSEKI-MOJI

Reference on FIGURE VI - 73	③	④
NAME	MOJI WHARVES (FIGURE VI - 76)	COAL WHARF
Location on waterfront	Extends northward from Shiroki-saki	Extends southward from Shiroki-saki
Purpose for which used	General cargo and passengers, overseas shipping.	Coal storage and supply, bunkering vessels.
Type of construction	Masonry quay, block paving.	Believed masonry quay
Description:	Face (ft.)	Face (ft.)
Dimensions	4,350	2,740
Depth of water	33	24 to 15
Berthing space available	4,350	2,740
Width of apron	50	Open wharf
Capacity per sq. ft. (lbs.)	Unlimited	Unlimited
Lighted or unlighted	Lighted	Lighted
Transit sheds:	5	None
Type of construction	Believed masonry	
Length and width	Three 540′ by 100′; two 420′ by 100′.	
Total floor area	356,000 sq. ft.	
Number of floors	1	
Height between floors	18′	
Allowable load per sq. ft. (lbs.)	No data	
Lighted or unlighted	No data	
Mechanical handling facilities	One 3-ton locomotive crane; one 15-ton electric crane.	Industrial trackage; 1 stationary and 2 traveling coal conveyors.
Railway connections	About 5,000 linear feet of tracks in rear of sheds.	Five lines of tracks, total length 13,500′, in rear of quay.
Water supply	No data	No data
Electric current	No data	No data
Estimated terminal capacity	4,200	2,520
Remarks	Berthage: seven 450-ft. boats drawing up to 33′; can care for 25,000-ton vessels.	Berthage: one 450-ft. ship drawing 20′; eight 200-ft. vessels drawing 12′.

Reference on FIGURE VI - 73	⑤		⑥	⑦
NAME	BREWERY PIER		DESHIMACHI WHARVES	TAKEZAKIMACHI WHARF
Location on waterfront	Opposite Sakura Brewery, Dairi.		SE shore of Hiko-shima about ¼ mi. southward from Deshima-chi-hana	Takezakimachi, Shimonoseki
Purpose for which used	General grain and brewery cargo		Coal and oil bunkering	General cargo coastal shipping
Type of construction	Timber deck on timber piling, T head.		Believed masonry quays	Believed masonry quay
Description:	Face (ft.)	Approach (ft.)	Face (ft.)	Face (ft.)
Dimensions	150	150 by 20	250 + 200 + 200 + 100 + 250	750
Depth of water	15		12 to 15	22
Berthing space available	150		250 + 200 + 200 + 100 + 250	750
Width of apron	20		Open wharves	Open wharf
Capacity per sq. ft. (lbs.)	No data		No data	Unlimited
Lighted or unlighted	No data		No data	No data

TABLE VI - 17 *Continued*

PIERS, WHARVES, AND QUAYS AT SHIMONOSEKI-MOJI

Transit sheds	No data	No data	1
Length and width			450′ by 30′
Total floor area			13,500 sq. ft.
Number of floors			1
Height between floors			No data
Allowable load per sq. ft. (lbs.)			No data
Mechanical handling facilities	No data	Probable pipe lines	No data
Railway connections	None	None	About 2,400′ of tracks on quay; chart shows large amount switching track on quay face.
Water supply	No data	No data	Available on wharf from city mains
Electric current	No data	No data	No data
Estimated terminal capacity	240	960	960
Remarks	Berthage: one 200-ft. vessel drawing 12′	Several small slips break the continuity of quay; berthage—four 200-ft. vessels drawing 12′.	This quay accessible through Koseto; has no access to main harbor except by land; berthage—two 350-ft ships drawing 20′.

Reference on FIGURE VI - 73)	⑧	⑨	⑩
NAME	RAILROAD WHARF	FUSAN KAISHA WHARF (FIGURE VI - 77)	KANNONSAKIMACHI WHARF
Location on waterfront	SW part of Shimonoseki	Eastward of Reference ⑧; fronts railroad yards.	Kannonsakimachi, Shimonoseki
Purpose for which used	General cargo	General cargo and passengers; overseas shipping.	General cargo, overseas shipping.
Type of construction	Masonry quay	Masonry blocks and caissons on rubble base	Masonry blocks and caissons on rubble base
Description:	Face (ft.)	Face (ft.)	Face (ft.)
Dimensions	300 + 100	1,050	1,200
Depth of water		27	24
Berthing space available	200	1,050	850
Width of apron	Open wharf	40	Open wharf
Capacity per sq. ft. (lbs.)	Unlimited	Unlimited	Unlimited
Lighted or unlighted	Lighted	Lighted	Lighted
Transit sheds:	2	1	2
Type of construction	Wooden frame and siding	Wooden frame and siding	No data
Length and width	200′ by 30′; 100′ by 30′.	700′ by 40′	120′ by 40′; 200′ by 40′
Total floor area	9,000 sq. ft.	28,000 sq. ft.	12,800 sq. ft.
Number of floors	1	1	No data
Height between floors	16′	16′	—
Allowable load per sq. ft. (lbs.)	No data	No data	No data
Lighted or unlighted	Lighted	Lighted	No data
Mechanical handling facilities	One hand operated fixed crane, capacity unknown, located at eastern end.		No data
Railway connections	About 400′ of track at rear of quay	About 900 linear feet of tracks on quay side; railroad switch track on apron.	Railroad line at rear of wharf, about 800′ of track.
Water supply	Available on wharf from city mains	Available on wharf from city mains	Available on wharf from city mains

TABLE VI - 17 *Continued*

PIERS, WHARVES, AND QUAYS AT SHIMONOSEKI-MOJI

Electric current	No data	No data	No data
Estimated terminal capacity	240	1,200	1,080
Remarks	1 berth for 200-ft. ship drawing 12′; other space for barges only; step landing breaks the continuity of quay. W end might be blocked off by reclaimed land.	2 berths for 450-ft. ships drawing 26′.	1 berth for 450-ft. ship drawing 20′; one 350-ft. ship drawing 20′; Mole extending from SW corner probably could not be used for handling cargo.

Reference on FIGURE VI - 73	⑪	⑫
NAME	SHIMONOSEKI WHARF	SOTOHAMAMACHI WHARF (FIGURE VI - 78)
Location on waterfront	Northward from Reference ⑩	Northeastward from Reference ⑪.
Purpose for which used	General cargo and passengers, ocean shipping.	General cargo; overseas shipping.
Type of construction	Concrete caissons on rubble base; pavel fill.	Concrete caissons on rubble base
Description:	Face (ft.)	Face (ft.)
Dimensions	1,800	1,200
Depth of water	27 to 22	18 to 24
Berthing space available	1,800	360 and 550
Width of apron	40	Open wharf
Capacity per sq. ft. (lbs.)	Unlimited	Unlimited
Lighted or unlighted	Lighted	Lighted
Transit sheds:	5	1
Type of construction	Wooden frame and siding	No data
Length and width	Two 400′ by 100′, Three 300′ by 100′.	240′ by 40′
Total floor area	170,000 sq. ft.	9,600 sq. ft.
Number of floors	1	No data
Height between floors	16	—
Lighted or unlighted	Lighted	No data
Mechanical handling facilities	No data	No data
Railway connections	1,800′ of tracks at rear of sheds; believed to have 3,600′ of tracks on quayside.	None
Water supply	Available from city mains on wharf	Available on wharf from city mains
Electric current	No data	No data
Estimated terminal capacity	1800	480 (only 4 hatches useful)
Remarks	Berthage: two 450-ft. ships drawing 26′; one 450-ft. ship drawing 20′.	Berthage: one 450-ft. ship drawing 20′ at jetty; one 350-ft. ship drawing 20′.

FIGURE VI - 78. *Shimonoseki-Moji.*
Sotohamamachi wharf (Reference ⑫), looking north-northwestward.

TABLE VI - 18.

OTHER LANDING PLACES AT SHIMONOSEKI-MOJI

Location and Reference on FIGURE VI - 73	USE	LENGTH OF QUAY FT.	DEPTHS FT.	FACILITIES
Moji:				
⑬ Kajiga-hana	No data	600	3 to 9	Warehouses
⑭ Basin No. 2	General cargo	1,600	3 to 6	Buildings that might be warehouses; railroad track on apron.
⑮ Basin No. 1	Boat landings	1,000	3 to 6	1 warehouse; 1 railroad track.
⑯ In front of harbor police station (3 wharves)	Boat landings	——	12	No data
⑰ In front of harbor police station	Ferry landing	40	10	No data
⑱ In front of railroad station	Ferry landing	110	16	Railroad passenger station about 120′ from shore
⑲ Kazuba coal basin	Barge landing for loading coal	2,590	3 to 18	Coal dump; tracks in rear of coal yard; may have mechanical handling facilities.
Shimonoseki:				
⑳ S of Yamasokon-hana	No data	1,100	4 to 10	Buildings that might be used for warehouses
㉑ Enoura (FIGURE VI - 79)	Shipyard facility	Indefinite	4 to 21	Shipyard equipment
㉒ Railroad yards, E end (FIGURE VI - 80)	Ferry landing; 3 general purpose landings.	One 150-ft; 3, 120-ft.	12 to 14	No data
㉓ Customs landing	Passengers and goods	40 on face; 80 on each side	18	No data
㉔ Ferry landing, customs dock	Passengers and goods	50 on face; 100 on each side	12	No data
㉕ Customs basin, Sotohamamachi	No data	1,600	6 to 12	Warehouses

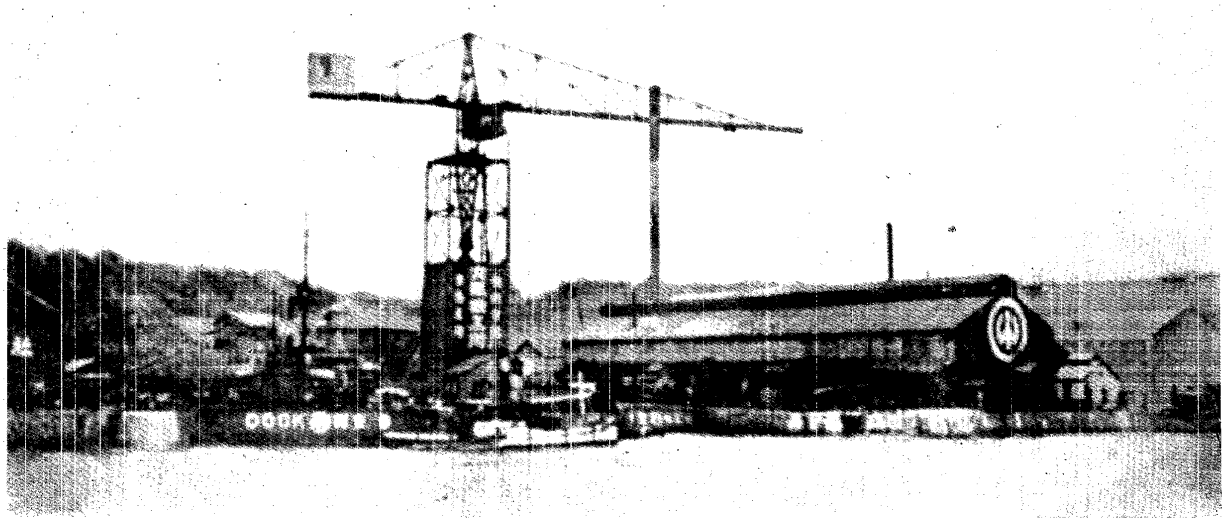

FIGURE VI - 79. *Shimonoseki-Moji.*
Enoura shipyards (Reference ㉑) showing 30-ton hammerhead crane at Osaka Iron Works dockyard, looking southwestward.

FIGURE VI - 80. *Shimonoseki-Moji.*
Ferry landing (Reference (22)), looking northeastward.

(*c*) *Storage facilities.* There probably are grain storage facilities at the Nippon Flour Mills at Dairi and the rice mills at Komoriye. It is believed that there are in excess of 800,000 square feet of warehouse space in the harbor area, mainly in Moji and its suburbs. These warehouses are, in the main, served by railroad sidings. The reclaimed area between Shimonoseki and Hika-shima has an open storage area of about 150 acres, reported to be served by railroad tracks. The coal wharf along the east side of Kazuba Basin has an area of about 16 acres served by railroad tracks and in general accessible to vessels drawing 9 to 12 feet; a short section has 18 feet alongside.

(*d*) *Capacity and clearance.* The unloading capacity of the port is estimated to be 15,120 tons per day. This does not include the unloading of barges for which no data are available.

In 1937 the foreign trade entering the port consisted of 3,148 ships of 9,575,000 gross registered tons. This traffic amounted to 13% of Japan's total. The percentage of the total Japanese imports by weight and value received at the port were 5.3% and 4.5% respectively in the years 1933 and 1937. In 1937 the percentage of the total exports was 2.1 per cent. In 1938 the total import and export trade amounted to $104,000,000.

Moji is the northern terminus of the railway lines on Kyūshū. Lines run to the Wakamatsu area, Sasebo, Nagasaki, Kagoshima, and other points on the island. An electric tramway connects Moji with nearby points.

The railway systems of Honshū Island terminate at Shimonoseki. An undersea tunnel (Kammin Tunnel) connects Moji with Shimonoseki. This tunnel has its northern entrance on Hiko-shima Island in the vicinity of Horigoshi, west of Deshimachi, and the southern entrance is at Komoriye, southward from Moji. The railroad crosses from Shimonoseki over the reclaimed land between the town and Hiko-shima, crosses the canal and runs behind the dockyards to the northern entrance to the tunnel. The reclaimed land above mentioned is the site of a new railroad station and yards. It is reported that a new double track standard gauge line is under construction between Tokyo and Shimonoseki.

Good roads serve the various cities and towns in the harbor area and lead to other points. A ten-minute ferry service connects Moji and Shimonoseki, and half hourly service to Hiko-shima. There are 4 large railroad ferry boats connecting Moji with Shimonoseki.

1. WATER. Water is piped from the Shimonoseki city system to the wharves. At Moji water is piped from the city system to the wharves near the south side of Basin No. 1, but it is not known if other wharves are served. Ships in the harbor are supplied by waterboats.

2. OIL AND GASOLINE. Several oil companies have storage facilities on Hiko-shima with a total storage capacity reported to be about 543,400 barrels. In addition the Standard-Vacuum Oil Company has storage plants and godowns at Dairi and Moji. The Rising Sun Petroleum Company (Shell) has 2 tanks, believed for gasoline, with a capacity of 45,500 barrels, in the southern part of Deshimachi. In addition to the above there are bunker fuel oil (Diesel) tanks with a capacity of 144,000 barrels. Ships moor 300 feet off the end of a pier in depths of 29 feet and discharge or receive oil through a floating pipeline 8 inches in diameter at the rate of 1,300 to 1,430 barrels per hour. The warehouse floor area totals 6,600 square feet. The Japan Oil Company has 2 tanks with a capacity of 26,000 barrels at Deshimachi, northward of the Rising Sun Petroleum Company storage. This company also has 2 smaller tanks and 2 large sheds for filling cans with kerosene and gasoline.

The Mitsubishi Company (Tidewater Associated Oil Co.) has 2 tanks with a capacity of 45,500 barrels and one of about 400 barrels capacity (FIGURE VI - 81). The location is believed to be in the vicinity of their dockyards. There are reported to be 8 tanks located at Tanokubi, but data regarding their capacity and ownership are not available. The Standard-Vacuum Oil Company has storage facilities on Hiko-shima northwestward from the Japan Oil Company storage plant. This storage is believed to be near Deshimachi-hana. The capacity is unknown. At Moji, this company has a plant known as the Sotohama godown, located behind the foreign trade zone. Also at Dairi, this company has 2 tanks for gasoline with a capacity of 31,000 barrels each, and 2 tanks for kerosene with capacities of 39,200 and 18,200 barrels respectively. There are also reported to be 2 tanks in Moji for fuel oil with capacities of 6,500 and 5,200 barrels respectively. These are owned by Japanese firms.

3. COAL. Moji is an important coaling port. The coaling wharves extend from Shiroki-saki to Komoriye. It is reported that the coal in storage at Moji ranges from 500,000 to 1,000,000 tons. Large quantities of coal are stored at Hiko-shima in the vicinity of and adjacent to the oil storage facilities. Coal is handled by basket from lighters. At Moji the facilities for handling coal include 1 stationary and 2 traveling coal conveyors. Coal piers are accessible to barges and lighters only.

4. ELECTRICITY. Moji and its suburbs of Komoriye and Dairi are lighted by electricity but there are no data available regarding the plant's location, capacity, or current characteristics. Shimonoseki has 2 power plants, both located on the coast in the

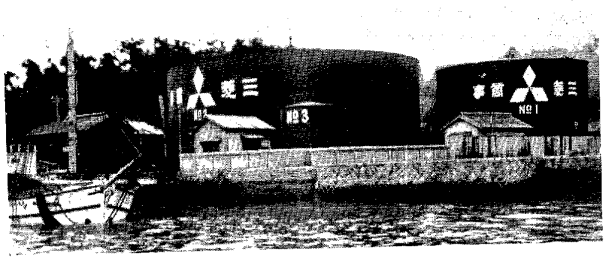

FIGURE VI - 81. *Shimonoseki-Moji.*
Mitsubishi storage plant at Deshimachi on Hiko-shima, looking southwestward. 1936.

vicinity of Danourachō and Maeda, that are believed to be coal burning, steam turbine operated.

(e) *Repair facilities.* The dry dock and repair facilities at Enoura on Hiko-shima are as follows (all are graving docks):

Dock No.	Construction	Length Top (ft.)	Length Bottom (ft.)	Width of entrance (ft.)	Depth above block (ft.)
		Mitsubishi Dockyard			
1	Concrete	399.6	390	69.8	25.5
2	Concrete	460.0	450	74.8	25.5
3	Concrete	264.5	255	35.4	18.5
		Osaka Iron Works			
8	Concrete	222	200	37.0	15.0
9	Stone	288	280	55.0	22.0

In addition to the Mitsubushi and Ōsaka drydocks, recent aerial reconnaissance shows 3 drydocks on the Kō-seto, 210 feet, 180 feet, and 190 feet long and a 165-foot drydock on the Hayatomo-seto. A number of small boatyards are on Hiko-shima, the Kō-seto, and the Hayatomo-seto.

The Mitsubishi Shipyard and the Ōsaka Iron Works are both well equipped to handle all types of repairs. Heavy drop forgings and castings are obtainable. The Mitsubishi Yards have a marine railroad capable of lifting vessels up to 1,000 tons.

(6) Kōbe (34° 40′ N, 135° 10′ E).

The most important port and sixth largest city of Japan, Kōbe is one of the 3 ports at the head of Ōsaka-wan, a body of water indenting the south coast of Honshū and forming the eastern end of the Inland Sea. Kōbe is about 14½ miles eastward from Ōsaka across the head of Ōsaka-wan. Together with Ōsaka, the second city of Japan, and Amagasaki, a smaller port between the 2 larger cities, Kōbe handles the overseas traffic for the industrial heart of Japan—the Ōsaka-Kōbe-Kyōtō triangle (Figures VII - 3 and VII - 4)*. In 1941, it was reported that the Japanese were developing Kōbe and Ōsaka as a single port.

At Kōbe, breakwaters form a capacious artificial inner harbor which provides 12 first-, 28 second-, and 50 third-class anchorage berths in 4 to 6½ fathoms. Mooring buoys in the harbor accommodated 20,000-ton vessels with lengths up to 700 feet. Outside the breakwaters, there is unlimited anchorage for all types of ships in depths up to 7 fathoms. A system of canals connects the harbor with industries several miles inland.

Since 1906, the harbor at Kōbe has undergone extensive development, including the reclamation of land and the construction of landing facilities; since 1935 this development work has been intensified and was still in progress during 1941. In addition to the miles of quayed waterfront for use by lighters and smaller vessels, there are 147 vessel berths at the main piers, wharves, and quays; 13 of the berths can handle 600-foot vessels drawing 30 feet and 32 additional berths can handle large vessels drawing 25 feet or more.

*Transportation facilities and relief of Kyōtō-Ōsaka-Kōbe area, Chapter VII.

A large number of cranes and other mechanical handling facilities are available at the wharves, including electrically operated 1½- to 5-ton traveling cranes and ½- to 30-ton stationary cranes. A 1936 census showed that there were more than 2,000 lighters and about 80 tugs at Kōbe. In addition, water boats and oil barges are available. A conservative estimate places the available warehouse and transit shed storage space at 5,700,000 square feet; 2,600,000 square feet of this estimate is warehouse space. Extensive facilities are available for handling coal, gasoline and oil, other ship supplies, and the construction and repair of ships.

(a) *Harbor.* A series of 5 breakwaters protects a capacious artificial inner harbor with general depths of 27 to 42 feet (Figure VI - 82). The water area within the breakwaters was about 2,400 acres in 1927. One of the principal breakwaters is being reconstructed in part at a greater distance from shore, increasing this water area to about 2,575 acres. The harbor limits, as defined by local authorities, are nearly 12 miles apart and embrace a large water area outside the breakwaters.

The harbor fronts Kōbe proper and Hyōgo, formerly a separate municipality and now a part of Kōbe. The water area is divided for administrative purposes into 5 districts; Areas Nos. 1 and 2 lie within the breakwaters; and Nos. 3, 4, and 5 lie outside. Area No. 1, principally devoted to foreign trade, lies off that part of the Kōbe waterfront extending from the northern entrance to the inner harbor as far southward as Kawa-saki (point); Area No. 2, used for domestic trade, lies off that part of the Hyogo waterfront extending southward from Kawa-saki to Wada-misaki (point), at the southernmost entrance to the inner harbor.

Karumo-shima, a narrow island nearly 0.5 mile long, is parallel to the shore 1.3 miles west of Wada-misaki. The Karumo Canal, between this island and the shore, is 200 feet wide and is dredged to 11¾ feet. A canal system with a least depth of 3 feet, serving adjacent industries in Hyōgo, connects the eastern end of the Karumo Canal with Area No. 2 of the inner harbor. From the western end of the Karumo Canal, a canal extends inland about 3 miles in a northerly direction. The common entrance to this canal and to the Karumo Canal is protected on the west side by a small breakwater.

The inner harbor is naturally protected from west to north by land, backed by a range of hills; the breakwaters afford shelter from southerly to easterly winds. The water area within the breakwaters is usually calm, but there are about 10 days a year when the loading of cargo is impossible, particularly at about the time of the autumnal equinox and during the winter months. From south to north, the breakwaters are: a jetty on the west side of the southernmost entrance following 3 courses with a total length of 1,132 feet; Breakwater No. 1, 4,003 feet long; Breakwater No. 2, 4,964 feet long; Breakwater No. 3, about 8,140 feet long, partially built on a curving line, and, except for the southernmost 900 feet, to be replaced by work under construction at a greater distance from the piers; and Breakwater No. 4, 3,576 feet long, described as a temporary structure pending proposed extension of the harbor works eastward.

1. ENTRANCE CHANNEL. The approaches to the entrances between the breakwaters have depths of 42 to 48 feet. The most northerly of the 5 entrances to the inner harbor has general depths of 27 to 30 feet, but in the other entrances depths range from 34 to 42 feet. Inside the inner harbor, there are 6 numbered fairways; no anchorage is permitted within their limits.

2. ANCHORAGE. There were 28 mooring buoys for large ships anchored in the inner harbor and 4 similar mooring buoys outside the breakwaters. Five of the buoys could accommodate 20,000-ton vessels up to 700 feet in length. The harbor bottom is mud and sand, good holding ground. Within the inner harbor there are 12 first-class, 28 second-class, and about 50 third-class anchorage berths, in depths of 4 to 6½ fathoms. Outside the breakwaters there is unlimited anchorage for all types of ships, in depths of up to 7 fathoms.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The lunitidal interval is 7 hours, 21 minutes. Springs rise 4.59 feet, and neaps rise 3.61 feet.

4. LOCAL WEATHER. Temperatures are cool in winter and warm in summer, with January and August mean temperatures of 41° and 82°. Temperatures as low as 22° in January and as high as 100° in August have been recorded; the latter was accompanied by high humidity. The mean annual rainfall is 53 inches. At the conjuncture of summer and autumn there are infrequent gales. Winds from between northeast and east, blowing at times throughout the year, are not of great velocity but interfere with lighterage operations. Northerly winds, locally known as "Kazen Waze," prevail in spring and autumn. Northwesterly winds prevail in winter, and westerly winds in summer.

(b) Landing facilities.

1. PIERS, WHARVES, AND QUAYS. The landing facilities have been almost entirely developed since 1906 as a part of a series of harbor works and extensive land reclamation along the waterfront, including substantial concrete and stone retaining walls, which can be used for wharfage. These wharf walls have been constructed to enclose sheltered basins for small craft; to form large, wide piers for ocean-going vessels; and to provide lighter wharves at the bulkheads between the piers. The piers are generally equipped with cranes and transit sheds, and are serviced by flush railroad tracks.

In Area No. 1, which is entirely quayed, the most important group of wharves (References ④ to ⑪)* fronts the Customs Compound at Onohama and Hamabe-dori. (FIGURES VI - 83 to VI - 85). Since shortly before 1935 these piers have been numbered from west to east, and their transit sheds have been designated alphabetically.

It is reported that reclamation and additional wharfage construction were under way at Kōbe in 1941. As a part of the proposed plan for the extension of wharfage facilities, the Customs Compound is being extended eastward to include an area formerly occupied by a lumber basin; two additional piers, numbered 7 and 8, are to be constructed about the same length as Pier No. 6 (References ④ and ⑤). Pier No. 7 was reported to be under construction as far back as 1935. The projected extension of the harbor works eastward of the temporary breakwater includes land reclamation, 10 new piers, and protecting breakwaters. Some of the necessary land reclamation has been finished, but the present extent of progress in pier construction is not known.

In addition to the piers at the Customs Compound there are 2 other wharves west of the Customs Compound in Area No. 1 at which ocean-going vessels can be berthed: the recently-constructed Naka Tottei Pier (References ⑰ and ⑱); and Takahama Wharf (Reference ⑳).

The waterfront of Hyōgo, in Area No. 2, is entirely quayed and has several wharves at which ships can berth. Between the 2 entrances to Hyōgo Canal, there are 2 large piers (References ㉛ and ㉜). Adjoining these to the southward, construction of a third pier with a lighterage slip in its central part, similar to Pier No. 6 (References ④ and ⑤), has been planned. To the south-

*References are encircled numbers on FIGURE VI - 82.

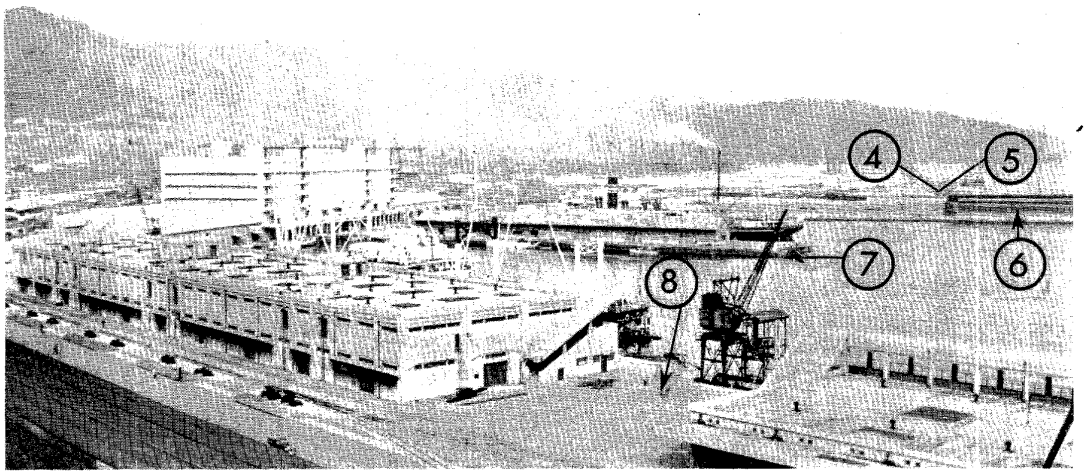

FIGURE VI - 83. *Kōbe.*
Looking north-northeastward across Pier No. 4 (Reference ⑧). Toshin Pier and Quay (Reference ⑦) at center; Piers Nos. 6 and 5 (References ④ to ⑥) shown under construction at right center; Toshin warehouse and sheds in rear of Toshin Pier and Quay (Reference ⑦). 1935.

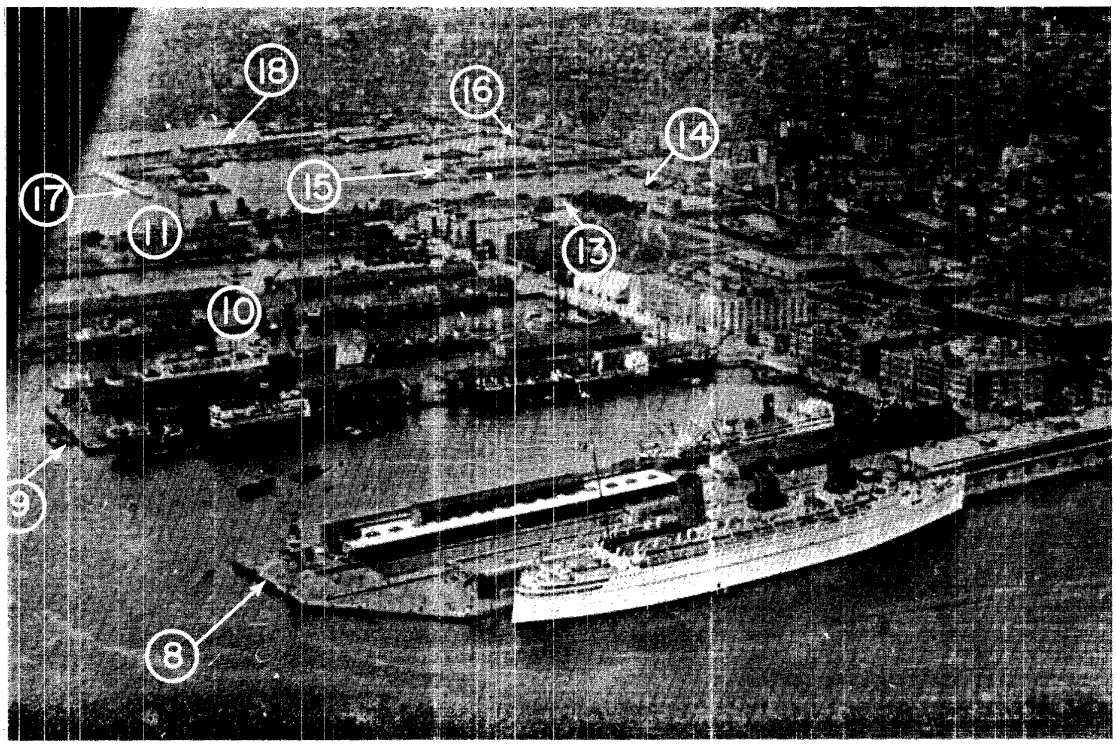

FIGURE VI - 84. *Kōbe.*
Aerial view looking west-northwestward Piers Nos. 4 to 1 (References ⑧ to ⑪). References ⑬ to ⑱ in center background. Warehouses shown to rear of Piers Nos. 4 to 1. Prior to 1935.

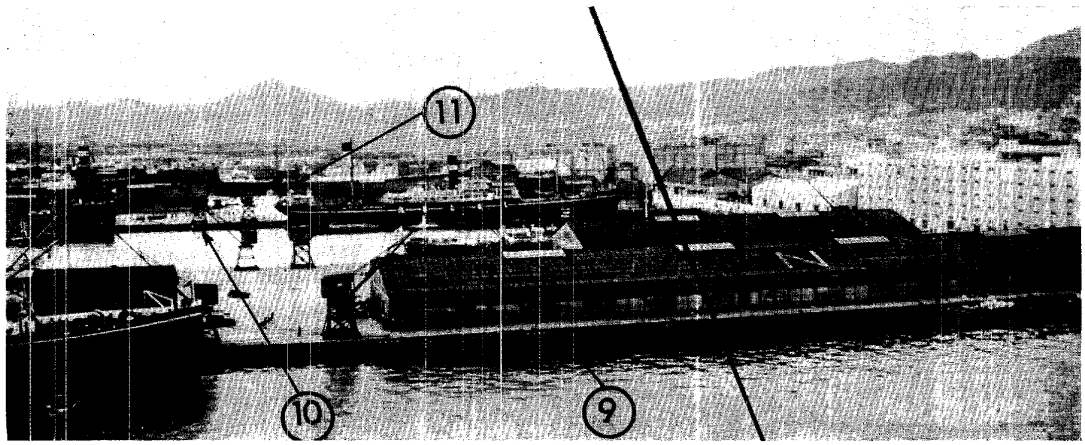

FIGURE VI - 85. *Kōbe.*
Piers Nos. 3, 2, and 1 (References ⑨ to ⑪), looking west-northwest, showing warehouses to the rear of piers. 1935.

ward is Wada Pier and Wada Wharf (References ㉞, ㉟ and ㊱) which extends to the Mitsubishi dockyard.

Several of the piers in the port afford berths for very large ships; the "Empress of Britain" has been berthed on the east side of Pier No. 4 (Reference ⑧). This vessel is 733 feet long, has a draft of 32 feet 8 inches, and is of 42,348 gross tons. TABLE VI - 19 gives the distribution of vessel berths by lengths and drafts.

Details of the principal wharves and their facilities are shown in TABLE VI - 20.

TABLE VI - 19

DISTRIBUTION OF VESSEL BERTHS AT KŌBE

TOTAL VESSEL BERTHS	VESSEL LENGTHS (FT.)	ALLOWABLE DRAFTS (FT.)	LOCATION BY REFERENCE NUMBERS ON FIGURE VI - 82
13	600	30	④ to ⑨ inclusive
5	450	28	④ ⑧ ⑱ ㉓
23	450	26	⑥ ⑨ ⑩ ⑪ ⑳ ㉛ ㉜ ㉟ ㊴
13	450	20	① ⑰ ⑳ ㉛ ㊱ ㊲ ㊴
2	350	28	⑰ ⑱
2	350	25	④ ㉜
6	350	20	① ⑦ ⑳ ㉛
1	350	18	㉓
27	250	16	① ② ⑬ ⑱ ㉒ ㉙ ㉚ ㉛ ㉞
12	200	Any draft	④ ⑨ ⑩ ⑪ ⑰ ㉜ ㊳
43	200	12	③ ⑧ ⑬ ⑮ ⑱ to ㉓ inclusive, and ㉕ to ㉚ inclusive
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TABLE VI - 20

PIERS, WHARVES, AND QUAYS AT KŌBE

Reference on FIGURE VI - 82	①	②
NAME	WHARF	CUSTOMS PIER
Location on waterfront	Outer harbor, Area No. 4; 330 yds. E of northernmost entrance to inner harbor.	Area No. 1; 150 yds. W of northernmost entrance to inner harbor
Owned and operated by	No data	Japanese Government
Purpose of which used	No data	Landing for customhouse
Type of construction	Bulkhead walls, retaining solid fill.	Pier, and bulkhead retaining solid fill.
Description:		
Dimensions	Face (ft.) 850; E side (ft.) 1,000; W side (ft.) 775	Face (ft.) 75; E side (ft.) 125; W side (ft.) 125; Bulkhead (ft.) 1,500 + 625
Depth of water	21; 21 to 18; 21 to 18	18; 18; 18; 18 to 16
Berthing space available	850; 500; 400	75; 125; 125; 1,500 + 625
Width of apron	No data	No data
Deck above L.L.W.	No data	No data
Capacity (lbs. per sq. ft.)	Unlimited	Unlimited
Lighted or unlighted	No data	No data
Transit sheds	No data	No data
Mechanical handling facilities	No data	No data
Railway connections	No data	None
Water supply	No data	No data
Estimated terminal capacity	1,350	125
Remarks	Bulkhead believed usable for wharfage, affording berths for one 450-ft. and one 350-ft. vessel drawing 20′ and two 250-ft. vessels drawing 16′.	Bulkhead believed usable for wharfage affording berths for seven 250-ft. vessels drawing 16′.

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KOBE

Reference on FIGURE VI - 82	③	④
NAME	QUAY	PIER NO. 6, E SECTION
Location on waterfront	Area No. 1; 920 yds. NW of N head of Breakwater No. 4.	Hamabe-dori, Area No. 1; 1,200 yds. W of Breakwater No. 4.
Owned and operated by	Kawasaki Dockyard Co.; Kobe Steel Works	Japanese Government
Purpose for which used	No data	E side, handling general cargo to and from ships; W side, lighterage.
Type of construction	Believed to be masonry wall, retaining solid fill.	Reinforced concrete caissons, surmounted by concrete bulkhead faced with masonry, retaining solid fill.
Description:	Bulkhead wharf (ft.)	Face (ft.) / E side (ft.) / W side (ft.)
Dimensions	2,550 + 675	210 / 1,460 / 1,342
Depth of water	18 to 10	31 / 31 to 28 / 10
Berthing space available	2,550 + 675	210 / 1,460 / 1,342
Width of apron	No data	Open wharf
Deck above L.L.W.	No data	11
Capacity (lbs. per sq. ft.)	Unlimited	Unlimited
Lighted or unlighted	No data	Lighted
Transit sheds	None	None on pier; 9 or 10 sheds believed constructed on the upland; total gross floor area about 400,000 sq. ft.
Mechanical handling facilities	At Kobe Steel Works; five 5-ton stationary electric cranes.	One 5-ton and two 1½-ton traveling electric full-portal gantry cranes believed installed.
Railway connections	None	Trackage at root of pier
Water supply	No data	Fresh water is available
Electric current	No data	No data
Estimated terminal capacity	3,000	1,700
Remarks	Depths shown are about 100′ off the quay; thirteen 200-ft. vessels drawing 12′ probably can be berthed.	One 200-ft. vessel can berth at face; E side of pier affords berthage for one 600-ft. vessel drawing 30′, one 450-ft. vessel drawing up to 28′, and one 350-ft. vessel drawing 25′. (FIGURE VI - 83).

Reference on FIGURE VI - 82	⑤
NAME	PIER NO. 6, W SECTION
Location on waterfront	Hamabe-dori, Area No. 1; 1,325 yds. W of Breakwater No. 4.
Owned and operated by	Japanese Government
Purpose for which used	W side, handling general cargo to and from ships; face and E side, lighterage.
Type of construction	Reinforced concrete caissons, surmounted by concrete bulkhead face with masonry, retaining solid fill.
Description:	Face (ft.) / E sice (ft.) / W side (ft.) / Bulkhead to W (ft.)
Dimensions	160 / 1,342 / 1,470 / 564
Depth of water	33 / 10 / 33 / 9
Berthing space available	160 / 1,342 / 1,470 / 564
Width of apron	Open wharf / 50 / 20 / 60
Deck above L.L.W.	11 / / / 7½
Capacity (lbs. per sq. ft.)	Unlimited
Lighted or unlighted	Lighted

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Transit sheds:	2
Type of construction	Concrete
Length and width (ft.)	370 by 52; 450 by 52
Total floor area, gross (sq. ft.)	127,920
Number of floors	3
Mechanical handling facilities	One 5-ton and two 1½-ton traveling electric gantry cranes, and a 12-ton stationary steam crane on bulkhead.
Railway connections	One 1,250-ft. track on E apron
Water supply	Fresh water available
Electric current	No data
Estimated terminal capacity	1,200
Remarks	In slip between E and W sections of Pier No. 6, two 600-ft. vessels drawing 30′ can be berthed at W side. (FIGURE VI - 83)

Reference on FIGURE VI - 82	⑥
NAME	PIER NO. 5
Location on waterfront	Hamabe-dori, Area No. 1; 1,530 yds. W of Breakwater No. 4.
Owned and operated by	Japanese Government
Purpose for which used	Handling general cargo in foreign trade
Type of construction	Reinforced concrete caissons, surmounted by concrete bulkhead faced with masonry, retaining solid fill.

Description:	Face (ft.)	E side (ft.)	W side (ft.)
Dimensions	475	1,470	1,470
Depth of Water	27	31	39 to 31
Berthing space available	475	1,470	1,470
Width of apron	60 to 100	40	20
Deck above L.L.W.	11		

Capacity (lbs. per sq. ft.)	Unlimited
Lighted or unlighted	Lighted
Transit sheds:	5
Type of construction	Concrete
Length and width (ft.)	360 by 70; 510 by 75; 300 by 80; 500 by 80; 525 by 80.
Total floor area, gross (sq. ft.)	169,450 (ground floor)
Number of floors	No data
Mechanical handling facilities	Two 5-ton and four 1½-ton traveling electric full-portal gantry cranes believed installed.
Railway connections	4 tracks totaling 4,800′ in rear of transit sheds
Water supply	Fresh water available
Electric current	No data
Estimated terminal capacity	3,000
Remarks	Four 600-ft. vessels drawing 30′ and a 450-ft. vessel drawing 26′ can be berthed at the pier. (FIGURE VI - 83)

Reference on FIGURE VI - 82	⑦
NAME	TOSHIN PIER AND QUAY
Location on waterfront	Onohama, Area No. 1; 2,170 yds. NE of Kawa-saki Signal Station
Owned and operated by	Toshin Warehousing Co.

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Purpose for which used	Handling general cargo in foreign trade				
Type of construction	Believed to be stone-faced concrete bulkheads, retaining solid fill.				
Description:	Face (ft.)	E side (ft.)	W side (ft.)	Bulkhead wharves (ft.) E	W
Dimensions	118	625	597	420	470
Depth of Water	31	33 to 30	33 to 31	30	30 to 22
Berthing space available	118	625	597	420	470
Width of apron	150	33	33	About 25	
Deck above L.L.W.	No data	—	—	No data	
Capacity (lbs. per sq. ft.)	No data	—	—	Unlimited	
Lighted or unlighted	Lighted	—	—	Lighted	
Transit sheds:	1 (on pier)				
Type of construction	No data				
Length and width (ft.)	375 by 52				
Total floor area, gross (sq. ft.)	19,500				
Number of floors	1				
Mechanical handling facilities	On bulkhead: one 3-ton steam shear-leg derrick; one 5-ton and one 4-ton traveling electric crane; 4 electric ½-ton straight-line cranes.				
Railway connections	None				
Water supply	No data				
Electric current	None				
Estimated terminal capacity	2,000				
Remarks	Warehouse and additional sheds in rear of quay; two 600-ft. vessels drawing 30′, and two 350-ft. vessels drawing 20′ can be berthed. (FIGURES VI - 83 and VI - 86)				

Reference on FIGURE VI - 82	⑧			
NAME	PIER NO. 4			
Location on waterfront	Onohama, Area No. 1; 1,650 yds. ENE of Kawa-saki Signal Station			
Owned and operated by	Japanese Government			
Purpose for which used	Handling general cargo and passengers in foreign trade			
Type of construction	Reinforced concrete caissons, surmounted by concrete bulkhead faced with masonry, retaining solid fill.			
Description:	Face (ft.)	E side (ft.)	W side (ft.)	Bulkhead to W (ft.)
Dimensions	125 + 150 + 125	1,550	1,290	540
Depth of water	33	39 to 31	36 to 31	31 to 19
Berthing space available	125 + 150 + 125	1,550	1,290	540
Width of apron	210 to 135	25	23	Marginal street
Deck above L.L.W.	11	—	—	7½
Capacity (lbs. per sq. ft.)	Unlimited			
Lighted or unlighted	Lighted			
Transit sheds:	4			
Type of construction	2 of concrete; 2 of steel and galvanized iron.			
Length and width (ft.)	550 by 126; 612 by 126; 468 by 84; 540 by 84.			
Total floor area, gross (sq. ft.)	231,084 (ground floor)			
Number of floors	1 and 2			

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Mechanical handling facilities	On pier: four 1½-ton and one 5-ton traveling electric full-portal gantry cranes. On bulkhead: three 5-ton stationary electric cranes.
Railway connections	One 1,215-ft. track on W apron; 2 tracks totaling 2,430′ in rear of transit sheds on W side of pier.
Water supply	Fresh water available.
Electric current	None
Estimated terminal capacity	2,700
Remarks	Pier is 384 feet wide; warehouses on the upland; three 600-ft. vessels drawing 30′, one 450-ft. vessel drawing up to 28′, and two 200-ft. vessels drawing 12′ can be berthed. (FIGURES VI - 83, VI - 84, VI - 86, VI - 87, and VI - 88)

Reference on FIGURE VI - 82	⑨
NAME	PIER NO. 3
Location on waterfront	Onohama Area No. 1; 1,370 yds. NE of Kawa-saki Signal Station
Owned and operated by	Japanese Government
Purpose for which used	Handling general cargo in foreign trade
Type of construction	Reinforced concrete caissons, surmounted by concrete bulkhead faced with masonry, retaining solid fill.

Description:

	Face (ft.)	E side (ft.)	W side (ft.)	Bulkhead to W (ft.)
Dimensions	336	1,248	1,206	480
Depth of water	30	36 to 27	30 to 27	9
Berthing space available	336	1,248	1,206	480
Width of apron	60	23	23	Marginal street
Deck above L.L.W.	11	—	—	7½

Capacity (lbs. per sq. ft.)	Unlimited
Lighted or unlighted	Lighted
Transit sheds:	4
Type of construction	Steel and galvanized iron
Length and width (ft.)	504 by 84; 504 by 84; 288 by 84; 360 by 84.
Total floor area, gross (sq. ft.)	139,104
Number of floors	1
Mechanical handling facilities	On pier: two 5-ton and four 1½-ton traveling electric full-portal gantry cranes. On bulkhead: one 1½-ton traveling steam crane.
Railway connections	One 1,215-ft. track on E apron; 5 tracks totaling 5,700′ in rear of transit sheds; one 1,150-ft. track on W apron; one 315-ft. track on face apron.
Water supply	Fresh water available
Electric current	None
Estimated terminal capacity	2,500
Remarks	Warehouse and shed at the bulkhead wharf; one 600-ft. vessel drawing 30′, three 450-ft. vessels drawing 26′, and two 200-ft. vessels can be berthed. (FIGURES VI - 84, VI - 85, VI - 87, VI - 89, and VI - 90)

Reference on FIGURE VI - 82	⑩
NAME	PIER NO. 2
Location on waterfront	Onohama, Area No. 1; 1,170 yds. NE of Kawa-saki Signal Station
Owned and operated by	Japanese Government
Purpose for which used	Handling general cargo in foreign trade
Type of construction	Reinforced concrete caissons, surmounted by concrete bulkhead faced with masonry, retaining solid fill.

Description:

	Face (ft.)	E side (ft.)	W side (ft.)	Bulkhead to W (ft.)
Dimensions	336	1,200	1,200	480

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Depth of water	30	27	27	9
Berthing space available	336	1,200	1,200	480
Width of apron	60	23	23	Marginal street
Deck above L.L.W.	11	—	—	7½
Capacity (lbs. per sq. ft.)	Unlimited			
Lighted or unlighted	Lighted			
Transit sheds:	4			
Type of construction	Steel and galvanized iron			
Length and width (ft.)	288 by 84; 360 by 84; 432 by 84; 504 by 84.			
Total floor area, gross (sq. ft.)	133,056			
Number of floors	1			
Mechanical handling facilities	On pier: two 5-ton and four 1½-ton traveling electric full-portal gantry cranes; one 20-ton stationary hand-crane. At bulkhead: one stationary straight-line crane; one 5-ton, one 3-ton, and one 1½-ton traveling electric full-portal gantry cranes.			
Railway connections	2 tracks, each 1,160′ long, 1 on E and 1 on W apron; 5 tracks totaling 5,700′ in rear of transit sheds; one 315-ft. track on face apron.			
Water supply	Fresh water available			
Electric current	None			
Estimated terminal capacity	2,600			
Remarks	Warehouses and shed at the bulkhead wharf; four 450-ft. vessels drawing 26′ and three 200-ft. vessels can be berthed. (FIGURES VI - 84, VI - 85, and VI - 91)			

Reference on FIGURE VI - 82	(11)			(12)		
NAME	PIER NO. 1			MOLE		
Location on waterfront	Onohama, Area No. 1; 1,000 yds. NNE of Kawa-saki Signal Station			Onohama, Area No. 1; 1,350 yards NNE of Kawa-saki Signal Station		
Owned and operated by	Japanese Government			Japanese Government		
Purpose for which used	Handling general cargo in foreign trade			Landing for small craft		
Type of construction	Reinforced concrete caissons, surmounted by concrete bulkhead faced with masonry, retaining solid fill.			Masonry		
Description:	Face (ft.)	E side (ft.)	W side (ft.)	Face (ft.)	S side (ft.)	N side (ft.)
Dimensions	336	1,200	1,200	40	300	35 ∤ 265
Depth of water	30	28	31 to 27	27	27	22
Berthing space available	336	1,200	1,200	40	300	265
Width of apron	60	23	23	Open wharf		
Deck above L.L.W.	11			7½		
Capacity (lbs. per sq. ft.)	Unlimited			No data		
Lighted or unlighted	Lighted			No data		
Transit sheds:	6			None		
Type of construction	Steel and galvanized iron			—		
Length and width (ft.)	288 by 84; 288 by 84; 360 by 84; 288 by 84; 288 by 84; 360 by 84.			—		
Total floor area, gross (sq. ft.)	157,248			—		
Number of floors	1			—		
Mechanical handling facilities	Two 5-ton and four 1½-ton traveling electric full-portal cranes			None		
Railway connections	2 tracks, each 1,160′ long, 1 on E and 1 on W aprons; 4 tracks totaling 4,650′ in rear of transit sheds.			None		

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Water supply	Fresh water available	No data
Electric current	None	None
Estimated terminal capacity	2,600	—
Remarks	Warehouses on the upland; four 450-ft. vessels drawing 26′ and three 200-ft. vessels can be berthed. (FIGURES VI - 84; VI - 85, and VI - 91)	Shoreward 265′ of mole is 20′ wide
Reference on FIGURE VI - 82	⑬	⑭
NAME	KYOBASHI HATOBA (NO. 1 WHARF)	CENTER HATOBA
Location on waterfront	Onohama, Area No. 1; 1,360 yds. N of Kawasaki Signal Station.	Kaigan-dori, Area No. 1; 1,670 yds. N of Kawasaki Signal Station.
Owned and operated by	Japanese Government	Japanese Government
Purpose for which used	Handling general cargo in domestic trade	Lighterage
Type of construction	Concrete bulkhead, faced with stone, supported on reinforced concrete caissons, retaining solid fill.	Believed to be masonry wall, retaining solid fill.
Description:	Bulkhead wharf (ft.)	Bulkhead wharf (ft.)
Dimensions	735 + 240	950
Depth of water	18 to 15	9
Berthing space available	735 + 240	900
Width of apron	35	50
Deck above L.L.W.	7½	No data
Capacity (lbs. per sq. ft.)	Unlimited	Unlimited
Lighted or unlighted	Lighted	No data
Transit sheds:	2	None
Type of construction	Wooden	
Length and width (ft.)	336 by 72; 192 by 72.	
Total floor area (sq. ft.)	38,016	
Number of floors	1	
Mechanical handling facilities	Four 3-ton and one 2-ton stationary hand cranes	No data
Railway connections	2 tracks in rear of each transit shed, total length 1,450′	None
Water supply	Fresh water available	No data
Electric current	None	None
Estimated terminal capacity	1,000	—
Remarks	Two 250-ft. vessels drawing 16′ and two 200-ft. vessels drawing 12′ can be berthed. (FIGURES VI - 84 and VI - 92)	Customs and Harbor Office on the upland (FIGURES VI - 84 and VI - 93)

Reference on FIGURE VI - 82	⑮			⑯
NAME	BANKOKU WHARF (AMERICAN HATOBA)			NO. 2 WHARF
Location on waterfront	Kaigan-dori, Area No. 1; 1,420 yds. N of Kawa-saki Signal Station.			Kaigan-dori, Area No. 1; 1,630 yds. N of Kawasaki Signal Station.
Owned and operated by	Japanese Government			Japanese Government
Purpose for which used	Handling general cargo in domestic trade			Lighterage
Type of construction	Masonry wall, solid fill.			Believed to be masonry wall, solid fill.
Description:	End (ft.)	E side (ft.)	W side (ft.)	Face (ft.)

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Dimensions	60 + 50 + 175	75 + 660	600	760
Depth of water	18	18 to 9	15 to 9	9
Berthing space available	Landings	660	550	760
Width of apron	100	75	75	50
Deck above L.L.W.	No data			No data
Capacity (lbs. per sq. ft.)	Unlimited			Unlimited
Lighted or unlighted	Lighted			No data
Transit sheds:	2			3
Type of construction	Steel and galvanized iron			Wooden
Length and width (ft.)	225 by 94; 140 by 94.			No data
Total floor area, gross (sq. ft.)	34,310			43,551
Number of floors	1			1
Mechanical handling facilities	No data			No data
Railway connections	Tracks 250′ in rear of pier			Tracks 250′ from quayside
Water supply	Fresh water believed available			No data
Electric current	None			None
Estimated terminal capacity	500			—
Remarks	Pier averages 245′ wide; landing pier projects 150′ to W from outer end of W side; two 200-ft. vessels drawing 12′ can be berthed. (FIGURES VI - 84 and VI - 93)			(FIGURE VI - 84)

Reference on FIGURE VI - 82	⑰			⑱		
NAME	NAKA TOTTEI PIER SPUR			NAKA TOTTEI PIER		
Location on waterfront	Kaigan-dori, Area No. 1; E side of Naka Tottei Pier, 1,130 yds. N of Kawa-saki Signal Station.			Kaigan-dori, Area No. 1; 890 yds. N of Kawa-saki Signal Station.		
Owned and operated by	Japanese Government			Japanese Government		
Purpose for which used	Handling general cargo in foreign trade			Handling general cargo in domestic and foreign trade		
Type of construction	No data			Concrete bulkhead faced with stone, supported by reinforced concrete caissons, retaining solid fill.		
Description:	Face (ft.)	N side (ft.)	S side (ft.)	Face (ft.)	E side (ft.)	W side (ft.)
Dimensions	35	275 + 275	525	299	709 + 1,180 + 175	896 + 1,417
Depth of water	27	30 and 21	21	30	30 and 18 to 19	30 to 18
Berthing space available	None	275 + 275	525	299	709 + 1,800 + 175	896 + 1,417
Width of apron	Open wharf			100	30	30
Deck above L.L.W.	6½			6½		
Capacity (lbs. per sq. ft.)	No data			Unlimited		
Lighted or unlighted	No data			No data		
Transit sheds:	None			10		
Type of construction	—			Wooden		
Length and width (ft.)	—			225 by 35; 3 sheds 200 by 35; 210 by 50; 275 by 50; 325 by 50; 340 by 50; 375 by 50; 375 by 75.		
Total floor area, gross (sq. ft.)	—			133,250 (ground floor)		
Number of floors	—			No data		

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Mechanical handling facilities	No date	No data (cranes believed installed)
Railway connections	None	Believed to have 2 tracks totaling 4,600′ and 2 tracks totaling 1,500′.
Water supply	No data	Fresh water believed available
Electric current	None	None
Estimated terminal capacity	1,300	4,000
Remarks	Pier width 35′ at outer part, and 100′ at inner part; one 450-ft. vessel drawing 20′, a 350-ft. vessel drawing up to 28′, and a 200-ft. vessel can be berthed. (FIGURE VI - 84)	Pier affords berths for two 450-ft. vessels drawing up to 28′, one 350-ft. vessel drawing up to 28′, five 250-ft. vessels drawing 16′, and six 200-ft. vessels drawing 12′. (FIGURE VI - 84)

Reference on FIGURE VI - 82	⑲	⑳
NAME	KOKUSAN HATOBA (NO. 3 WHARF)	TAKAHAMA WHARF
Location on waterfront	Kaigan-dori, Area No. 1; 1,420 yds. NNW of Kawa-saki Signal Station.	Area No. 1; 810 yds. NNW of Kawa-saki Signal Station.
Owned and operated by	Japanese Government	Mitsubishi Warehouse Co., Ltd.
Purpose for which used	Handling general cargo in domestic trade; lighterage.	Handling general cargo in domestic trade; lighterage.
Type of construction	Masonry wall, retaining solid fill.	Masonry wall, retaining solid fill.

Description:	Face (ft.)	E side (ft.)	W side (ft.)	Bulkhead E side (ft.)	Face (ft.)	N side (ft.)	S side (ft.)
Dimensions	230	300	230	364	1,100	300+50	725
Depth of water	16	18	15	9	27 to 24	12	24 to 9
Berthing space available	230	300	230	364	1,075	300	700
Width of apron	40	70	70	Open	40	60	80
Deck above L.L.W.	6½			6½	No data		
Capacity (lbs. per sq. ft.)	Unlimited				Unlimited		
Lighted or unlighted	Lighted				Lighted		
Transit sheds:	No data				5		
Type of construction					No data		
Length and width (ft.)					No data		
Total floor area, gross (sq. ft.)					243,740		
Number of floors					1		
Mechanical handling facilities	No data				One 15-ton electric stationary crane; four 1½-ton steam traveling gantry cranes; eight 3-ton electric traveling gantry cranes; one ½-ton derrick; two 1-ton and seven ½-ton electric hoists; two ¼-ton stacking machines.		
Railway connections	Tracks 275 feet from quayside				1 track along face, length unknown; tracks 350′ from face of quay, extending to 60′ from S side.		
Water supply	Fresh water available				Fresh water is available.		
Electric current	None				None		
Estimated terminal capacity	700				1,800		
Remarks	Three 200-ft. vessels drawing 12′ can be berthed.				In addition to transit sheds, 44 warehouses on upland; quay affords berths for one 450-ft. vessel drawing 26′, one 450-ft. vessel drawing up to 20′, two 200-ft. vessels drawing 12′.		

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Reference on FIGURE VI - 82	㉑	㉒
NAME	PIER	RAILWAY PIER
Location on waterfront	Area No. 1; 840 yds. NW of Kawa-saki Signal Station.	Area No. 1; 700 yds. NNW of Kawa-saki Signal Station.
Owned and operated by	No data	Imperial Government Railways
Purpose for which used	Believed to be lighterage	Handling general cargo in domestic trade; coal bunkering.
Type of construction	No data	No data
Description:	Face (ft.) / N side (ft.) / S side (ft.) / Bulkhead to S (ft.)	Face (ft.) / N side (ft.) / S side (ft.)
Dimensions	20 / 190 / 100 / 160	65 / 459 / 459
Depth of water	18 / 18 to 15 / Under 18 / Under 13	16 / 22 to 13 / Under 16
Berthing space available	190 / 100 / 160	65 / 459 / 459
Width of apron	Open wharf	Open wharf
Deck above L.L.W.	No data	No data
Capacity (lbs. per sq. ft.)	No data	No data
Lighted or unlighted	No data	Lighted
Transit sheds	No data	None
Mechanical Handling facilities	No data	No data
Railway connections	Tracks pass by S end of bulkhead	At least one 450-ft. track
Water supply	No data	Fresh water available
Electric current	None	None
Estimated terminal capacity	250	500
Remarks	One 200-ft. vessel drawing 12′ can be berthed at pier	One 250-ft. vessel drawing 16′ and one 200-ft. vessel drawing 12′ can be berthed at N side.

Reference on FIGURE VI - 82	㉓	㉔
NAME	KAWASAKI DOCKYARD WHARF	KAWASAKI HATOBA
Location on waterfront	Area No. 1; 540 yds. N of Kawa-saki Signal Station.	Areas Nos. 1 and 2; N and S from Kawa-saki Signal Station
Owned and operated by	Kawasaki Dockyard Co., Ltd.	No data
Purpose for which used	Outfitting vessels; receipt of material by lighter.	Lighterage
Type of construction	Believed to be masonry wall, retaining solid fill.	5 open-pile mooring piers, each about 55′ by 20′, projecting from bulkhead.
Description:	Face (ft.) / N side (ft.) / S side (ft.)	Bulkhead and shore wharves (ft.)
Dimensions	225 / 490 + 50 + 275 / 410	1,150
Depth of water	22 / 31 to 13 / 19	16 to 9
Berthing space available	2 landings / 490 + 275 / 410	623
Width of apron	25 / 20 to 75 / 40	50 to 140
Deck above L.L.W.	No data	No data
Capacity (lbs. per sq. ft.)	Unlimited	Unlimited
Lighted or unlighted	Lighted	Lighted
Transit sheds	None	9
Type of construction		Wooden
Length and width (ft.)		350 by 75; 250 by 150; 210 by 65; 210 by 65; 210 by 50; 200 by 50; 150 by 65; 150 by 50; 140 by 50.

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Total floor area, gross (sq. ft.)		135,800
Number of floors		1
Mechanical handling facilities	No data	No data
Railway connections	No data	Railway trackage totaling 13,200′ reported at terminal.
Water supply	Fresh water available	Fresh water available
Electric current	No data	None
Estimated terminal capacity	1,000	
Remarks	2 oil tanks at outer end of wharf, capacity about 34,500 bbls.; one 450-ft. vessel drawing up to 28′, one 350-ft. drawing 18′, and one 200-ft. drawing 12′ can be berthed.	

Reference on FIGURE VI - 82	㉕	㉖
NAME	QUAY	QUAY
Location on waterfront	Area No. 2; Hyogo, S side of Kawa-saki.	Area No. 2; Hyogo, 1,140 yds. W of Kawa-saki Signal Station.
Owned and operated by	Japanese Government	Japanese Government
Purpose for which used	Lighterage; mooring floating drydocks.	Handling general cargo in domestic trade
Type of construction	Believed to be masonry wall, retaining solid fill.	Believed to be masonry wall, retaining solid fill.
Description:		
Dimensions	Bulkhead wharf (ft.)	Bulkhead wharf (ft.)
Depth of water	1,100 + 850 + 1,050	325
Berthing space available	16	13
Width of apron	320	325
Deck above L.L.W.	Open wharf	Open wharf
Capacity (lbs. per sq. ft.)	No data	No data
Lighted or unlighted	Unlimited	Unlimited
	No data	No data
Transit sheds	No data	None
Mechanical handling facilities	No data	None
Railway connections	None	None
Water supply	No data	None
Electric current	None	None
Estimated terminal capacity	250	250
Remarks	2 floating drydocks moored at 1,050′ section; one 200-ft. vessel drawing 12′ can be berthed.	One 200-ft. vessel drawing 12′ can be berthed.

Reference on FIGURE VI - 82	㉗	㉘	㉙
NAME	SHIMAGAMI PIER	QUAY	MARKET QUAY
Location on waterfront	Area No. 2; Hyogo, 1,160 yds. WSW of Kawa-saki Signal Station.	Area No. 2; Hyogo, 1,170 yds. WSW of Kawa-saki Signal Station.	Area No. 2; Hyogo, 1,260 yds. WSW of Kawa-saki Signal Station.
Owned and operated by	Japanese Government	Japanese Government	Japanese Government
Purpose for which used	Handling general cargo in domestic trade	Handling general cargo in domestic trade	Handling general cargo in domestic trade
Type of construction	Pontoons	Believed to be masonry wall, retaining solid fill.	Believed to be masonry wall, retaining solid fill.

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KOBE

Description:	Face (ft.)	N side (ft.)	S side (ft.)	Face (ft.)	Face (ft.)
Dimensions	35	250	250	350+170	1,100
Depth of water	15	15 to 13	15	18 to 13	18 to 15
Berthing space available	35	250	250	350+170	1,100
Width of apron	Open wharf			No data	75 (Marginal street)
Deck above L.L.W.				No data	No data
Capacity per sq. ft. (lbs.)	Light loading			Unlimited	Unlimited
Lighted or unlighted	Lighted			Lighted	Lighted
Transit sheds	None			No data	No data
Mechanical handling facilities	No data			No data	Cranes believed available
Railway connections	None			None	One 1,100-ft. track on apron
Water supply	None			Fresh water available	Fresh water available
Electric current	None			None	None
Estimated terminal capacity	500			250	1,000
Remarks	Pier possibly no longer in place; two 200-ft. vessels drawing 12′ could be berthed.			One 200-ft. vessel drawing 12′ can be berthed at quay.	Municipal central wholesale market in rear of quay; three 250-ft. vessels drawing 16′, and one 200-ft. vessel drawing 12′ can be berthed. (FIGURE VI - 94)

Reference on FIGURE VI - 82	㉚	㉛			
NAME	QUAY	HYOGO NO. 1 PIER			
Location of waterfront	Area No. 2; Hyogo, 1,440 yds. SW of Kawasaki Signal Station.	Area No. 2; Hyogo, 640 yds. SSW of Kawa-saki Signal Station			
Owned and operated by	Japanese Government	Japanese Government			
Purpose for which used	Handling general cargo in domestic trade	Handling general cargo in foreign and domestic trade			
Type of construction	Stone-faced concrete bulkhead, supported on reinforced concrete caissons, retaining solid fill.	Stone-faced concrete bulkhead, supported on reinforced concrete caissons, retaining solid fill.			
Description:	Face (ft.)	Face (ft.)	N side (ft.)	S side (ft.)	Bulkhead to S (ft.)
Dimensions	400+1,200	417	1,432+600	1,432	479
Depth of water	21 to 15	24	24 to 19	30 to 24	24
Berthing space available	400+1,200	417	1,432+600	1,432	479
Width of apron	25	25	15 to 30	25	Open wharf
Deck above L.L.W.	10	10	—	—	—
Capacity per sq. ft. (lbs.)	Unlimited	Unlimited			
Lighted or unlighted	Lighted	Lighted			
Transit sheds:	6	About 20			
Type of construction	No data	No data			
Length and width (ft.)	3 sheds 250 by 50; 225 by 50; 185 by 50; 175 by 50	No data			
Total floor area, gross (sq. ft.)	66,750 (ground floor)	About 344,000 (ground floor)			
Number of floors	No data	No data			
Mechanical handling facilities	No data	4 traveling electric full-portal gantry cranes believed installed			
Railway connections	Trackage 200′ from quayside	Two tracks, each in rear of marginal transit sheds, total length 2,600 ft.			

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Water supply	Fresh water available	Fresh water is available
Electric current	None	None
Estimated terminal capacity	1,400	4,000
Remarks	Four 250-ft. vessels drawing 16′ and two 200-ft. drawing 12′ can be berthed.	Pier and bulkhead afford berths for one 450-ft. drawing 26′, five 450-ft. drawing 20′, two 350-ft. drawing 20′, and two 250-ft. drawing 16′.

Reference on FIGURE VI - 82	㉜				㉝
NAME	HYOGO NO. 2 PIER				QUAY
Location on waterfront	Area No. 2; Hyogo, 925 yds. SSW of Kawa-saki Signal Station.				Area No. 2; Hyogo, 1,250 yds. SW of Kawa-saki Signal Station.
Owned and operated by	Japanese Government				Japanese Government
Purpose for which used	Handling general cargo in foreign and domestic trade				Handling general cargo in domestic trade
Type of construction	Stone-faced concrete bulkhead, supported on reinforced concrete caissons, retaining solid fill.				Stone-faced concrete bulkhead, supported on reinforced concrete caissons, retaining solid fill.
Description:	Face (ft.)	N side (ft.)	S side (ft.)	Bulkhead to S (ft.)	Face (ft.)
Dimensions	417	1,432	1,432	230	1,050 + 350
Depth of water	28	28	28	22	No data
Berthing space available	417	1,432	1,432	230	1,050 + 350
Width of apron	20	15	35	35	50
Deck above L.L.W.	10				10
Capacity per sq. ft. (lbs.)	Unlimited				Unlimited
Lighted or unlighted	Lighted				Lighted
Transit sheds:	About 14				No data
Type of construction	No data				
Length and width (ft.)	No data				
Total floor area, gross (sq. ft.)	About 309,000				
Number of floors	No data				
Mechanical handling facilities	4 traveling electric gantry cranes believed installed.				No data
Railway connections	Two tracks, each in rear of marginal transit sheds, total length 2,600′.				Trackage parallels 1,050-ft. section for 500′ at 150′ from quayside
Water supply	Fresh water available				Fresh water available
Electric current	None				None
Estimated terminal capacity	3,500				—
Remarks	Six 450-ft. vessels drawing 26′, one 350-ft. drawing up to 25′, and one 200-ft. can be berthed.				Depths alongside not definitely determined; possibly 9 ft.

Reference on FIGURE VI - 82	㉞
NAME	WADA WHARF, N SECTION
Location on waterfront	Area No. 2; Hyogo, 1,580 yds. SW of Kawa-saki Signal Station.
Owned and operated by	Mitsubishi Warehouse Co., Ltd.
Purpose for which used	Handling general cargo in domestic trade
Type of construction	Believed to be masonry wall, retaining solid fill.
Description:	Bulkhead wharf (ft.)
Dimensions	535

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Depth of water	25 to 18
Berthing space available	535
Width of apron	20
Deck above L.L.W.	About 6½
Capacity per sq. ft. (lbs.)	Unlimited
Lighted or unlighted	Lighted
Transit sheds:	9 (including Reference ㊱)
Type of construction	No data
Length and width (ft.)	No data
Total floor area, gross (sq. ft.)	322,175
Number of floors	1
Mechanical handling facilities	Including References ㉝ and ㊱, sixteen 1½-ton stationary electric cranes; thirteen ¼-ton electric hoists; eight ½-ton derricks; 1 chute; 1 conveyor; eight ¼-ton stacking machines.
Railway connections	Trackage parallel to and 150′ from quayside
Water supply	Fresh water available
Electric current	None
Estimated terminal capacity	500
Remarks	In addition to transit sheds, 26 warehouses are at this wharf and wharf to S (Reference ㊱); two 250-ft. vessels drawing 16′ can be berthed.

Reference on FIGURE VI - 82	㉟			㊱
NAME	WADA PIER			WADA WHARF, S SECTION
Location on waterfront	Area No. 2; Hyogo, 1,530 yds. SW of Kawa-saki Signal Station.			Area No. 2; Hyogo, 1,700 yds. SW of Kawa-saki Signal Station.
Owned and operated by	Mitsubishi Warehouse Co., Ltd.			Mitsubishi Warehouse Co., Ltd.
Purpose for which used	Handling general cargo in foreign trade			Handling general cargo in domestic trade
Type of construction	No data			5 mooring piers, each about 55′ by 35′ project from bulkhead
Description:	Face (ft.)	N side (ft.)	S side (ft.)	Bulkhead and shore wharves (ft.)
Dimensions	Curved	597	597	1,300 + 750
Depth of water	27	27 to 22	27	24
Berthing space available	None	597	597	1,300 + 750
Width of apron	Open wharf			20
Deck above L.L.W.	About 6½			About 6½
Capacity per sq. ft. (lbs.)	No data			Unlimited
Lighted or unlighted	Lighted			Lighted
Transit sheds:	None			See Reference ㉞
Type of construction				
Length and width (ft.)				
Total floor area, gross (sq. ft.)				
Number of floors				
Mechanical handling facilities	See Reference ㉞			See Reference ㉞
Railway connections	3 tracks, total length about 1,500′			Trackage parallels N end of quay for 800′ at 125-ft. distance
Water supply	Fresh water available			Fresh water available
Electric current	None			None
Estimated terminal capacity	1,000			1,400
Remarks	Pier 62′ wide; two 450-ft. vessels drawing 26′ can be berthed (FIGURE VI - 95).			Warehouses on upland (Reference ㉞). Three 450-ft. vessels drawing 20′ can be berthed.

TABLE VI - 20 *Continued*

PIERS, WHARVES, AND QUAYS AT KŌBE

Reference on FIGURE VI - 82	㊲
NAME	OUTFITTING PIER
Location on waterfront	Area No. 2; Hyogo, 1,740 yds. SSW of Kawa-saki Signal Station.
Owned and operated by	Mitsubishi Heavy Industries, Ltd.
Purpose for which used	Outfitting vessels
Type of construction	Believed to be masonry and concrete
Description:	
Dimensions	Face (ft.): 50 + 550 + 550 — W side (ft.): 50 + 550 + 550 — E side (ft.): 60 + 625 + 450
Depth of water	Face (ft.): 27 — W side (ft.): 27 to 24 — E side (ft.): 27 to 9
Berthing space available	Face (ft.): None — W side (ft.): 550 — E side (ft.): Believed to be none
Width of apron	20
Deck above L.L.W.	No data
Capacity per sq. ft. (lbs.)	Unlimited
Lighted or unlighted	Lighted
Transit sheds	None
Mechanical handling facilities	No data
Railway connections	No data
Water supply	No data
Electric current	No data
Estimated terminal capacity	500
Remarks	Believed to have parapet wall along E side; floating dry dock berthed on W side at inshore 550-ft. section; one 450-ft. vessel drawing 20′ can be berthed.

Reference on FIGURE VI - 82	㊳
NAME	PIER
Location on waterfront	Area No. 2; Hyogo, 2,120 yds. S of Kawa-saki Signal Station.
Owned and operated by	Mitsubishi Heavy Industries, Ltd.
Purpose for which used	Receipt of material; outfitting vessels.
Type of construction	No data
Description:	
Dimensions	Face (ft.): 30 — W side (ft.): 150 — E side (ft.): 200 + 50
Depth of water	Face (ft.): 18 — W side (ft.): 9 — E side (ft.): 28
Berthing space available	Face (ft.): None — W side (ft.): 150 — E side (ft.): 200
Width of apron	Open wharf
Deck above L.L.W.	No data
Capacity per sq. ft. (lbs.)	Unlimited
Lighted or unlighted	Lighted
Transit sheds	None
Mechanical handling facilities	No data
Railway connections	No data
Water supply	No data
Electric current	No data
Estimated terminal capacity	250
Remarks	One 200-ft. vessel can be berthed.

	㊴
	OUTFITTING PIER
	Area No. 2; Hyogo, 1,950 yds. S of Kawa-saki Signal Station.
	Mitsubishi Heavy Industries, Ltd.
	Outfitting vessels
	Masonry and concrete
	Face (ft.): 30 — W side (ft.): 930 — E side (ft.): 1,000
	Face (ft.): 27 — W side (ft.): 31 to 24 — E side (ft.): 28 to 12
	Face (ft.): None — W side (ft.): 930 — E side (ft.): None
	20
	No data
	Unlimited
	Lighted
	None
	No data
	2 tracks total length about 2,000′
	No data
	No data
	1,000
	Parapet wall along E side; two 450-ft. vessels, one drawing 26′ and the other 20′, can be berthed (FIGURE VI - 96).

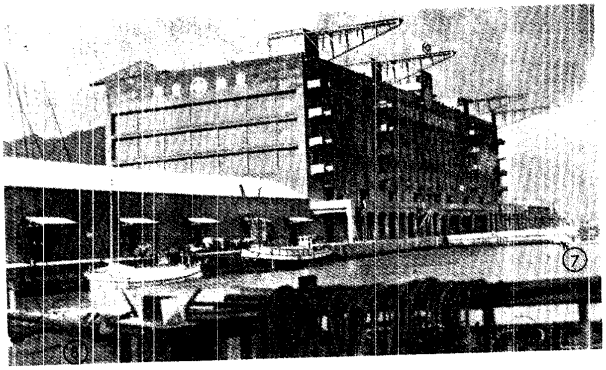

FIGURE VI - 86. *Kōbe.*
Toshin Pier and Quay (Reference ⑦), looking north-northeastward from Pier No. 4 (Reference ⑧). Toshin warehouse with cranes on top also shown. Prior to 1937.

FIGURE VI - 87. *Kōbe.*
Lighter wharf between Piers Nos. 4 and 3 (References ⑧ and ⑨), showing wharf cranes and Toshin warehouse, looking west-northwestward. 1935.

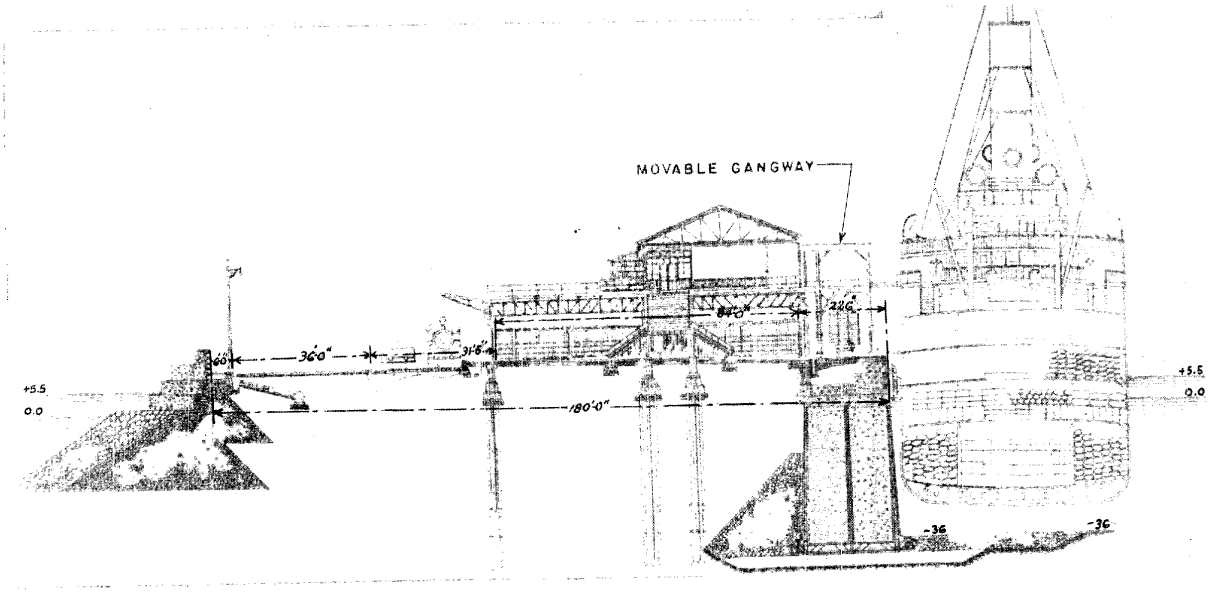

FIGURE VI - 88. *Kōbe.*
Drawing showing cross-section through Pier No. 4 (Reference ⑧), prior to widening of pier.

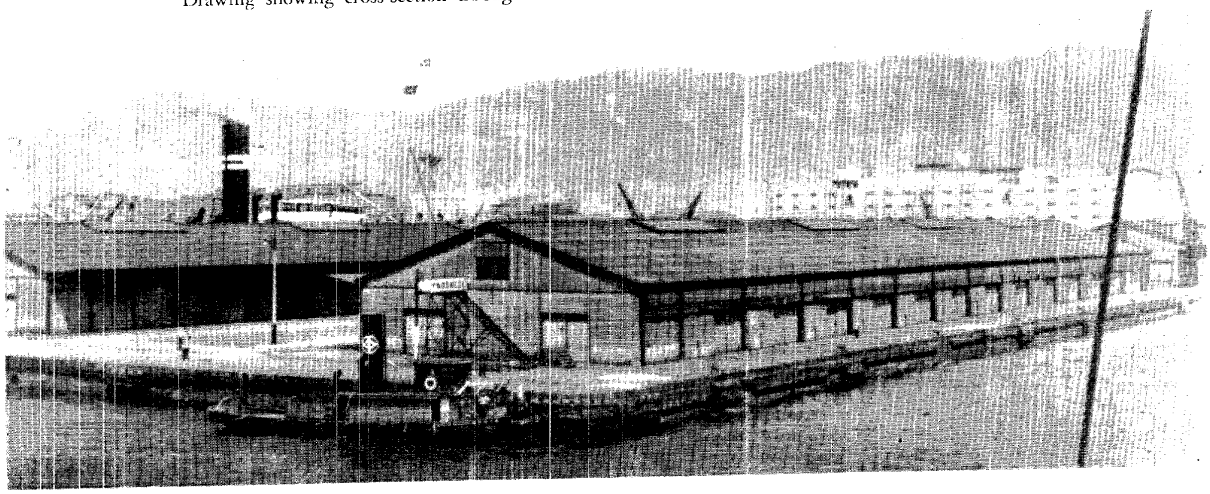

FIGURE VI - 89. *Kōbe.*
Pier No. 3 (Reference ⑨), looking northwestward, showing part of Mitsubishi Warehouse at right center. August 1939.

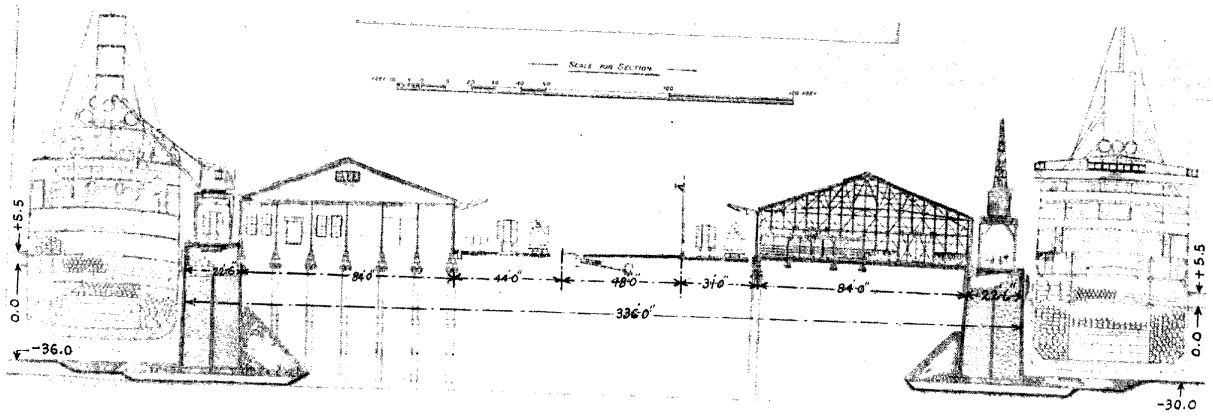

FIGURE VI - 90. *Kōbe.*
Drawing showing cross-section through Pier No. 3 (Reference ⑨).

FIGURE VI - 91. *Kōbe.*
Slip between Piers Nos. 1 and 2 (References ⑪ and ⑩), looking northward, showing cranes and warehouses at the head of slip.

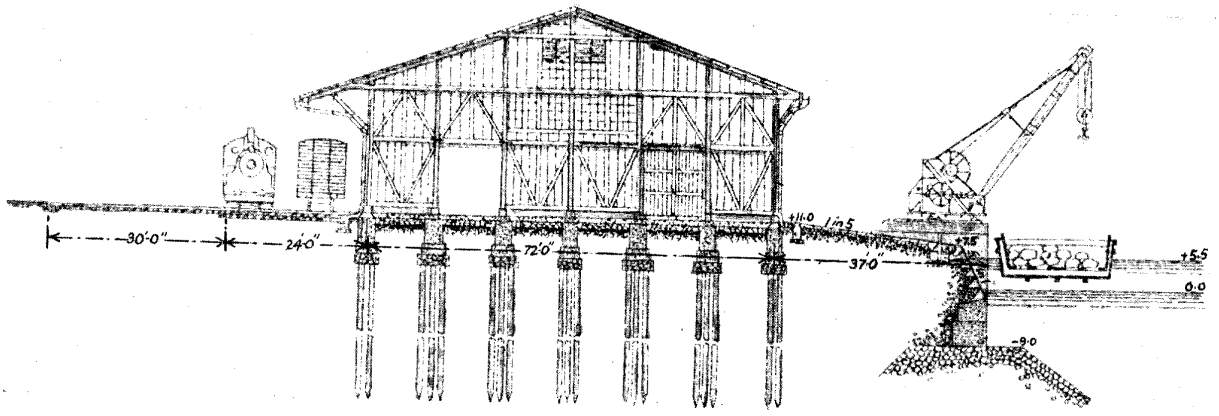

FIGURE VI - 92. *Kōbe.*
Drawing showing cross-section through 735-foot portion of Kyobashi Hatoba (Reference ⑬).

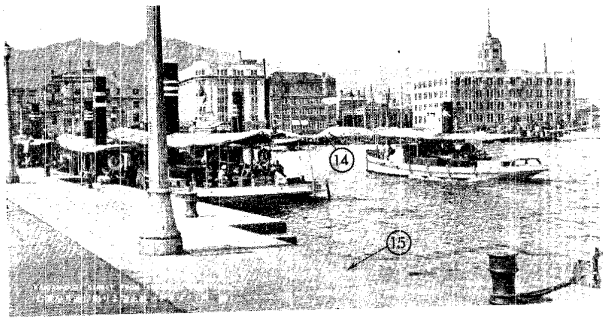

FIGURE VI - 93. *Kōbe.*
Center Hatoba (Reference ⑭), looking northeastward from side of Bankoku Wharf (Reference ⑮).

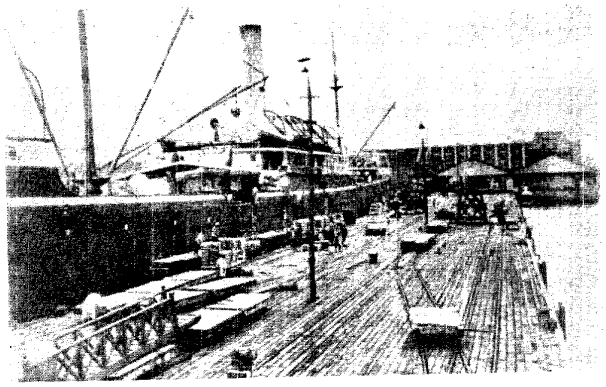

FIGURE VI - 95. *Kōbe.*
Wada Pier (Reference ㉟), looking southwestward.

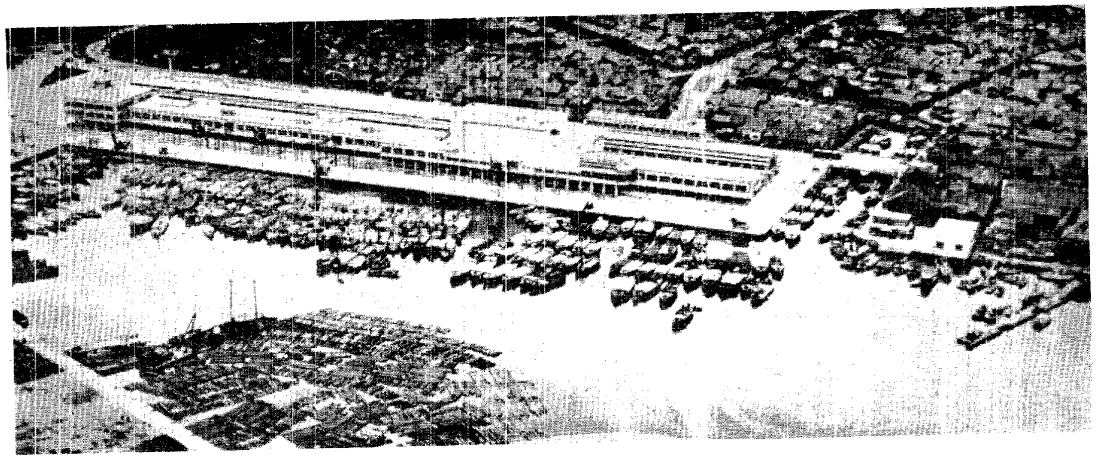

FIGURE VI - 94. *Kōbe.*
Aerial view of Market Quay (Reference ㉙), looking southwestward, showing municipal central wholesale market.

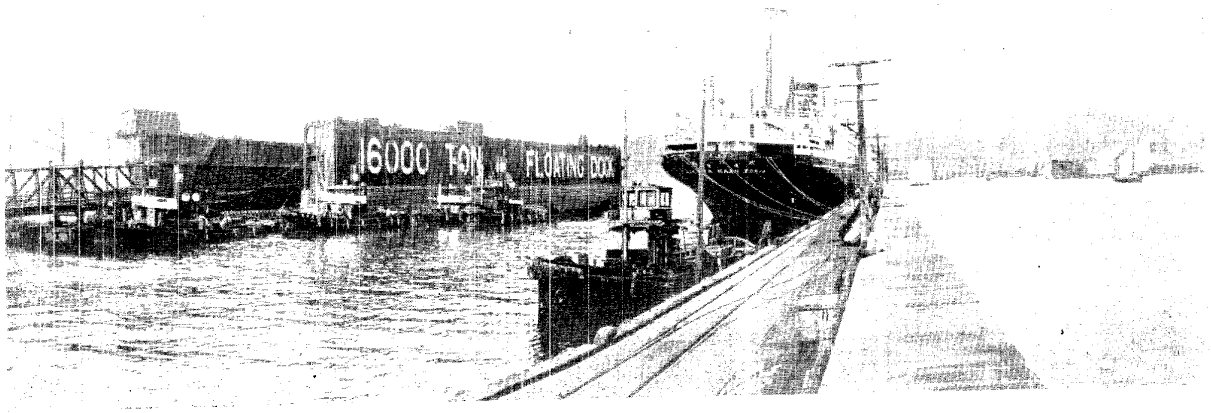

FIGURE VI - 96. *Kōbe.*
Outfitting pier (Reference ㊴) and Drydock No. 3 of the Mitsubishi interests, looking northward.

2. OTHER LANDING PLACES. At the eastern end of the Kōbe Steel Works, in the northeastern part of Area No. 1, a basin for small craft has a depth of 10 feet at its entrance. The basin, about 600 by 350 feet, is almost entirely quayed, with berthing space totaling 1,550 feet.

About 700 yards to the southwestward is the entrance to a large basin, about 3,000 feet long and 400 feet wide, formed by the extension of the Customs Compound eastward from Hamabe-dori. Depths in the basin may have been recently increased in conjunction with filling operations within the area adjacent to the southeast. The charted depths are in general 9 to 15 feet. The basin is believed to be entirely quayed, but the present total of such quayage and the depths alongside are not known. Opening from its northwestern side is Fukiai Harbor, a boat basin from 9 to 12 feet deep. The basin, about 650 feet by 400 feet, is entirely quayed, with berthing space totaling 1,925 feet. The quays of Fukiai Harbor and along the north side of the adjoining basin are believed to be used by adjacent industries.

The canal system in Hyogo is used by lighters and small craft. It serves the numerous industries on the canal banks. The canals vary in width from 48 to 210 feet, and the quays have depths alongside from 1½ to 10 feet, with general depths of 3 to 6 feet.

Extensive quayage with depths of about 11¾ feet alongside is available in the Karumo Canal, which lies about 1½ miles west of the southernmost entrance to the inner harbor. The inner side of Karumo-shima as well as the mainland appear to be entirely quayed, providing a total of almost 1 mile of berthing space for small craft.

The Rising Sun Petroleum Company, Ltd., operates a quay accessible to lighters at Nodamachi about 2¾ miles west of the southernmost entrance to the inner harbor. The quay appears to be about 1,100 feet long, with a depth of 12 feet alongside.

About 1,100 yards east of the eastern end of Karumo Canal a pier, about 25 feet wide and extending about 200 feet from shore into a depth of 6 feet, is charted. About 625 yards farther eastward, at the Quarantine Station, are 2 piers each about 15 feet wide and 150 feet long, with depths of from 3 to 1½ feet at their outer ends.

3. MECHANICAL HANDLING FACILITIES. A large number of cranes are available at the wharves. The traveling cranes, generally electrically-operated, are of 1½ and 5 tons capacity. Stationary cranes range from ½ to 30 tons capacity. It is believed that cranage has been recently increased to equip newly constructed wharves. Available details of hoisting facilities ashore are given in TABLE VI - 21 and of hoisting facilities afloat are given in TABLE VI - 22.

TABLE VI - 21

HOISTING FACILITIES ASHORE AT KŌBE

NUMBER AND KIND	LIFT CAPACITY TONS	POWER USED	BERTHING SPACE AVAILABLE LENGTH (FT.)	BERTHING SPACE AVAILABLE DEPTH L.L.W.	LOCATION AND REFERENCE ON FIGURE VI - 82	REMARKS
5 stationary cranes	5	Electric	About 1,150	18 to 16	Kobe Steel Works (Reference ③)	
1 traveling full-portal gantry crane	5	Electric	1,460	31 to 28	E side of E section of Pier No. 6 (Reference ④)	Proposed for installation in 1932
2 traveling full-portal gantry cranes	1½	do				
1 traveling full-portal gantry crane	5	do	1,470	33	W side of W section of Pier No. 6 (Reference ⑤)	do
2 traveling full-portal gantry cranes	1½	do				
1 stationary crane	12	Steam	564	9	Bulkhead W of Pier No. 6 (Reference ⑤)	do
2 traveling full-portal gantry cranes	5	Electric	2,940	39 to 31	Pier No. 5 (Reference ⑥)	do
4 do	1½	do				
1 traveling crane	5	do	890	30 to 22	Toshin Quay (Reference ⑦)	Straight-line cranes are mounted on roof of adjacent warehouse with reach to lighters berthed at quay (FIGURE VI - 86).
1 do	4	do				
1 stationary shear-leg	3	Steam				
4 straight-line cranes	½	Electric				
1 traveling full-portal gantry crane	5	Electric	2,840	39 to 31	Pier No. 4 (Reference ⑧)	FIGURE VI - 83
4 traveling full-portal gantry crane	1½	do				
3 stationary cranes	5	do	540	31 to 19	Bulkhead W of Pier No. 4 (Reference ⑧)	FIGURE VI - 87
2 traveling full-portal gantry cranes	5	Electric	2,454	36 to 27	Pier No. 3 (Reference ⑨)	
4 do	1½	do				

TABLE VI - 21 *Continued*

HOISTING FACILITIES ASHORE AT KOBE

NUMBER AND KIND	LIFT CAPACITY TONS	POWER USED	BERTHING SPACE AVAILABLE LENGTH (FT.)	BERTHING SPACE AVAILABLE DEPTH L.L.W.	LOCATION AND REFERENCE ON FIGURE VI - 82	REMARKS
1 traveling crane	1½	Steam	480	9	Bulkhead W of Pier No. 3 (Reference ⑨)	FIGURE VI - 87
2 traveling full-portal gantry cranes	5	Electric	2,400	27	Pier No. 2 (Reference ⑩)	FIGURE VI - 91
4 do	1½	do				
1 stationary crane	20	Hand				
1 traveling full-portal gantry crane	5	Electric	480	9	Bulkhead W of Pier No. 2 (Reference ⑩)	Straight-line crane serves Sumitomo Warehouse (FIGURE VI - 91)
1 do	3	do				
1 do	1½	do				
1 stationary straight-line crane	No data	No data				
2 traveling full-portal gantry cranes	5	Electric	2,400	31 to 27	Pier No. 1 (Reference ⑪)	FIGURE VI - 91
4 do	1½	do				
4 stationary cranes	3	Hand	573	18 to 15	Kyobashi Hatoba (Reference ⑬)	FIGURE VI - 92
1 stationary crane	2	Hand				
1 stationary crane	30	Hand	No data	No data	One of bulkheads at Onohama	Exact location not known
1 stationary crane	15	Electric	2,075	27 to 12	Takahama Wharf (Reference ⑳)	Whether hoists reach quayside is not known.
8 traveling full-portal gantry cranes	3	do				
4 do	1½	Steam				
1 derrick	½	No data				
2 hoists	1	Electric				
7 do	½	do				
1 stationary crane	100	No data	No data	No data	Kawasaki Dockyard (exact location not known)	
4 traveling full-portal gantry cranes	No data	Electric	2,864	30 to 24	Hyogo No. 1 Pier (Reference ㉛)	Believed to have been installed
4 do	do	do	2,864	28	Hyogo No. 2 Pier (Reference ㉜)	do
16 stationary cranes	1½	do	3,779	27 to 18	Wada Pier and Wada Wharf (References ㉞ to ㊱)	
13 electric hoists	1½	do				
8 derricks	½					
1 conveyor						
8 stacking machines	¼					

TABLE VI - 22

HOISTING FACILITIES AFLOAT AT KŌBE

NUMBER AND KIND	LIFT CAPACITY	POWER USED	OWNER OR OPERATOR
1 shearleg on lighter	50 tons	Steam	Kamigumi Goshi Kaisha
1 floating crane	15 tons	Steam	Kamigumi Goshi Kaisha
1 floating crane	200 tons	Steam	Kawasaki Dockyard Co.
1 floating crane	150 tons	Steam	Kawasaki Dockyard Co.
1 shearleg on lighter	60 tons	Steam	Kawasaki Dockyard Co.
1 shearleg on lighter	15 tons	Steam	Kawasaki Dockyard Co.
1 floating crane	25 tons	Steam	Kōbe Steel Works
1 shearleg on lighter	50 tons	Steam	Mitsubishi Heavy Industries, Ltd.
1 floating crane	15 tons	Steam	Mitsubishi Heavy Industries, Ltd.
1 floating crane	2 tons	Steam	Mitsubishi Warehouse Co., Ltd.
1 floating crane	1½ tons	Steam	Mitsubishi Warehouse Co., Ltd.
1 floating crane	13 tons	Steam	Toshin Warehousing Co.
1 floating crane	3 tons	Steam	Toshin Warehousing Co.

4. HARBOR CRAFT. According to a census in 1936 there were more than 2,000 lighters and about 80 tugs at Kōbe. The tugs included: 3 attached to the Customs Office—from 169 to 227 gross tons and from 675 to 1,400 effective horsepower; and 4 private tugs—from 64 to 123 gross tons and from 280 to 750 effective horsepower. In addition to the lighters, there were about 250 communication boats, used for conveyance of passengers and freight within the harbor.

For supplying water to vessels at anchor, there are 17 water boats, 12 equipped with pumps; 4 pump boats; and 3 small steam tugs for towing the water barges. Oil barges of from 1,000 to 1,500 barrels capacity also are available at the port.

(*c*) *Storage facilities.* The warehouses in the rear of Takahama Wharf (Reference ⑳) there are believed to include facilities for the storage of grain. The storage warehouses in the port, as distinguished from transit sheds, listed in TABLE VI -

20 (FIGURE VI - 97), are concentrated in 3 localities: the Customs Compound at Onohama and to the east, fronted by Piers Nos. 1 to 6 (References ④ to ⑪); the upland of Takahama Wharf (Reference ⑳); and the upland of Wada Pier and Wada Wharf (References ㉝ to ㊱). The warehouses in the Customs Compound are generally of multiple-story reinforced concrete construction, designed to be earthquake proof. All warehouses are adequately served by highway connections and railway sidings. The available details of the warehouses are listed in TABLE VI - 23.

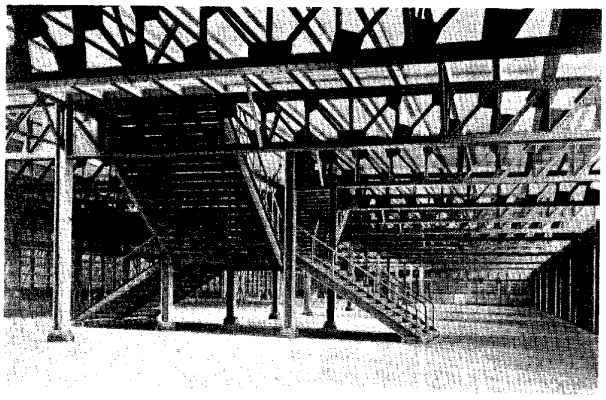

FIGURE VI - 97. *Kōbe.*
Interior of Shed "O" on Pier No. 4 (Reference ⑧).

TABLE VI - 23

STORAGE WAREHOUSES AT KŌBE

Reference on FIGURE VI - 82	⑦	⑦
NAME OF WAREHOUSE	TOSHIN WAREHOUSE	TOSHIN SHEDS
Exact location	In rear of Toshin Pier and Quay	In rear of Toshin Quay
Owner and operator	Toshin Warehousing Co.	Toshin Warehousing Co.
Description of warehouse:		
Type of construction	Reinforced concrete	Steel and corrugated iron
Number of floors	6	1
Building site area (sq. ft.)	About 60,000	138,000
Occupiable floor space (sq. ft.)	About 360,000 (gross)	138,000 (gross)
Method of transfer between ship and warehouse	4 straight-line cranes on roof: additional cranes on roof at rear side.	Wharf cranes
Equipment in warehouse, including elevators	No data	No data
Distance to nearest water terminal	25′	25′
Railroad sidings	Sidings available	Sidings available
Remarks	Warehouse flanked by sheds (FIGURES VI - 83 and VI - 86)	6 sheds (FIGURES VI - 83 and VI - 86)

Reference on FIGURE VI - 82	⑧	⑧
NAME OF WAREHOUSE	TOSHIN WAREHOUSE	MITSUBISHI COTTON WAREHOUSE
Exact location	In rear of bulkhead wharf W of Pier No. 4	In vicinity of Pier No. 4 (exact location not known)
Owner and operator	Toshin Warehousing Co.	Mitsubishi Warehouse Co., Ltd.
Description of warehouse:		
Type of construction	Reinforced concrete	No data
Number of floors	4, partly 5	No data
Building site area (sq. ft.)	84,650	No data
Occupiable floor space (sq. ft.)	350,500	170,880
Method of transfer between ship and warehouse	Wharf cranes and hoists	Truck
Equipment in warehouse, including elevators	Elevators and stevedoring equipment available	Elevators and stevedoring equipment available

TABLE VI - 23 *Continued*
STORAGE WAREHOUSES AT KŌBE

Distance to nearest water terminal	75′	Within 100 yds.
Railroad sidings	Sidings available	Sidings available
Remarks	2 structures (FIGURES VI - 84 and VI - 87)	Built in 1939 (FIGURE VI - 84)
Reference on FIGURE VI - 82	⑨	⑨
NAME OF WAREHOUSE	MITSUBISHI SHINKO WAREHOUSE	SHED
Exact location	In rear of Pier No. 3	At bulkhead W of pier No. 3
Owner and operator	Mitsubishi Warehouse Co., Ltd.	No data
Description of warehouse:		
Type of construction	Reinforced concrete	Steel and corrugated iron
Number of floors	5	1
Building site area (sq. ft.)	79,525	About 35,000
Occupiable floor space (sq. ft.)	336,085	About 35,000
Method of transfer between ship and warehouse	Wharf cranes	Wharf cranes
Equipment in warehouse, including elevators	Elevators and stevedoring equipment available	No data
Distance to nearest water terminal	80′	80′
Railroad sidings	Sidings available	Sidings available
Remarks	(FIGURES VI - 84, VI - 85, VI - 87 and VI - 89)	Shed about 220′ by 160′ (FIGURES VI - 84 and VI - 85)
Reference on FIGURE VI - 82	⑩	⑩
NAME OF WAREHOUSE	SHED	SUMITOMO WAREHOUSE
Exact location	In rear of Pier No. 2	At E end of bulkhead wharf W of Pier No. 2
Owner and operator	No data	Sumitomo Warehousing Co.
Description of warehouse:		
Type of construction	Appears to be wooden	Reinforced concrete
Number of floors	1	5
Building site area (sq. ft.)	About 35,000	36,000
Occupiable floor space (sq. ft.)	About 35,000	About 180,000
Method of transfer between ship and warehouse	No data	Wharf cranes
Equipment in warehouse, including elevators	No data	Elevators and stevedoring equipment available
Distance to nearest water terminal	80′	80′
Railroad sidings	Sidings available	Sidings available
Remarks	Shed about 220′ by 160′ (FIGURES VI - 84, VI - 85, and VI - 91)	Sidings available (FIGURES VI - 84, VI - 85, and VI - 91)
Reference on FIGURE VI - 82	⑩	⑪
NAME OF WAREHOUSE	KAWANISHI WAREHOUSE	KAWANISHI REFRIGERATION WAREHOUSE
Exact location	At W end of bulkhead wharf W of Pier No. 2	In rear of Pier No. 1
Owner and operator	Kawanishi Warehousing Co.	Kawanishi Warehousing Co.
Description of warehouse:		
Type of construction	Reinforced concrete	Reinforced concrete
Number of floors	5	4
Building site area (sq. ft.)	37,000	About 23,900
Occupiable floor space (sq. ft.)	About 184,650	About 95,600
Method of transfer between ship and warehouse	Wharf cranes	No data

TABLE VI - 23 *Continued*

STORAGE WAREHOUSES AT KŌBE

Equipment in warehouse, including elevators	Elevators and stevedoring equipment available	Elevators
Distance to nearest water terminal	80′	80′
Railroad sidings	Sidings are available	Sidings are available
Remarks	(FIGURES VI - 84, VI - 85, and VI - 91)	220′ long and from 120′ to 70′ wide (FIGURES VI - 84 and VI - 85)
Reference on FIGURE VI - 82	⑳	㉞ to ㊱
NAME OF WAREHOUSE	TAKAHAMA WAREHOUSES	WADA WAREHOUSES
Exact location	In rear of Takahama Wharf	In rear of Wada Pier and Wada Wharf
Owner and operator	Mitsubishi Warehouse Co., Ltd.	Mitsubishi Warehouse Co., Ltd.
Description of warehouse:		
Type of construction	No data	No data
Number of floors	Believed to be 1	No data
Building site area (sq. ft.)	364,800	404,860
Occupiable floor space (sq. ft.)	364,800	404,860
Method of transfer between ship and warehouse	Wharf cranes	Wharf cranes
Equipment in warehouse, including elevators	Two ¼-ton stacking machines	Thirteen ¼-ton electric hoists; 8 stacking machines; 1 chute; 1 conveyor.
Distance to nearest water terminal	Within 100 yds.	Within 100 yds.
Railroad sidings	Sidings available	Sidings available
Remarks	44 structures; grain believed stored in this locality.	26 structures (FIGURE VI - 95)

A tabulation of estimated storage space in storage warehouses and transit sheds is made in TABLE VI - 24. The estimates are believed to be conservative, in view of probable additional construction. Also the ground floor area alone is given in many cases where upper floor space is probably available though not possible to estimate. A large municipal central wholesale market (FIGURE VI - 94), at a quay (Reference ㉙) in Hyogo, has not been included, but is believed usable for storage. This structure is about 300 feet wide and 1,175 feet long, covering an area of about 352,500 square feet. Part of the building has 3 stories, but most of it has 2 stories.

Considerable uncovered storage space is available on the open wharves, between transit sheds, and to some extent on the wharf aprons. In particular, an area of about 6½ acres is available on the east section of Pier No. 6 (Reference ④). In the rear of Piers Nos. 5 and 6 (References ④ to ⑥) at least 5 acres are believed to be available; an additional area of at least 25 acres can be considered probably available as a result of filling operations to the eastward of, in the rear of, and within the limits of Piers Nos. 7 and 8, not definitely known to have been completed. This locality has rail and highway connections.

It is probable that a large area of open space is available at the northeast end of the harbor, where bulkheads have been constructed (References ① and ②) and land has been reclaimed. Highway connections to this area are available, but it is not known whether a railroad connection has been established.

(*d*) *Capacity and clearance.* The estimated total unloading capacity of the port is 50,000 short tons per day. The commerce of the port in 1934 is shown in TABLE VI - 25. The data are believed to be inclusive of domestic traffic.

TABLE VI - 24

TABULATION OF TRANSIT SHEDS AND STORAGE WAREHOUSES AT KŌBE

Reference on FIGURE VI - 82

LOCATION	STORAGE SPACE IN SQ. FT. Total	Transit sheds	Warehouses
④ to ⑥ In rear of Piers Nos. 5 & 6	400,000	400,000	—
⑤ Pier No. 6, W section	127,920	127,920	—
⑥ Pier No. 5	169,450	169,450	—
⑦ Toshin Pier and Quay	517,500	19,500	498,000
⑧ Pier No. 4	752,464	231,084	521,380
⑨ Pier No. 3	510,189	139,104	371,085
⑩ Pier No. 2	532,706	133,056	399,650
⑪ Pier No. 1	252,848	157,248	95,600
⑬ Kyobashi Hatoba	38,016	38,016	—
⑮ Bankoku Wharf	34,310	34,310	—
⑯ No. 2 Wharf	43,551	43,551	—
⑱ Naka Tottei Pier	133,250	133,250	—
⑳ Takahama Wharf	608,540	243,740	364,800
㉔ Kawasaki Hatoba	135,800	135,800	—
㉚ Quay, Hyogo	66,750	66,750	—
㉛ Hyogo No. 1 Pier	344,000	344,000	—
㉜ Hyogo No. 2 Pier	309,000	309,000	—
㉞ to ㊱ Wada Wharf and Pier	727,035	322,175	404,860
Totals	5,703,329	3,047,954	2,655,372

TABLE VI - 25

RECEIPTS AND SHIPMENTS, AT KŌBE, 1934
(000 omitted)

TOTALS Tons	TOTALS Value, in yen	RECEIPTS Tons	RECEIPTS Value, in yen	SHIPMENTS Tons	SHIPMENTS Value, in yen
13,644	2,762,951	8,859	1,307,515	4,785	1,455,436

The principal imports are raw cotton, rice, wheat, metals, wool and wool products, sugar, fertilizers, crude rubber, oil cake, hemp, jute, flax, lumber, and machinery. The principal exports are cotton yarns, camphor, tea, and silk. In 1937, Kobe handled 29.6% of the total value of imports of Japan and 34.9% of the total value of exports.

Road and rail communications are good. The principal wharves are all connected by railroad to the Sanyo main line and to the Shimonoseki and the Tōkaidō main line to Tōkyō. Trucks have access from all the wharves to the highway system. (FIGURE VIII - 109)*

(e) *Supplies.*

1. WATER. Fresh water is supplied by the municipality to hydrants on both the municipal and some of the private piers. There were in 1936 a total of 131 hydrants on the piers, each having a capacity of about 30 tons per hour. Water boats are also available, with pumping capacity of from 70 to 130 tons per hour.

2. OIL AND GASOLINE. There are 2 fuel oil storage tanks at the outer end of the Kawasaki Dockyard Wharf, with a combined capacity of about 34,500 barrels. This installation is operated by Kawasaki Kisen Kaisha. Construction of a 69,000-barrel tank at Kawa-saki, exact location not known, was begun in 1936 by the Mitsubishi Oil Company.

At Nodamachi, about 2¾ miles west of the southernmost entrance to the inner harbor, the Rising Sun Petroleum Company, Ltd., has oil storage facilities for 179,200 barrels of Diesel oil and 211,200 barrels of fuel oil. The wharf has a depth of only about 12 feet alongside, but a depth of 29 feet is available at 550 feet offshore. Tankers lie at anchor stern-to the wharf and discharge through a floating 6-inch pipeline at a rate of about 950 barrels per hour for Diesel oil and 1,150 barrels per hour for bunker oil. The maximum rate of bunkering, by pipeline, is about 900 barrels per hour.

Six large tanks have been reported about ½ mile west of Kobe. It was reported in 1938 that there were 2 groups of about 20 tanks each to the eastward of Kobe-kō. Storage capacities are not known. One group is marked Ogura Oil Company and the other Japan-Soviet Oil Company.

The Standard-Vacuum Oil Company controlled a tract of about 1¼ acres at the north corner of Fukiai-kō, in the northeastern part of the harbor. The facilities at this site are believed to be for warehousing of packaged products. This company also operated storage tanks located about 6½ miles to the eastward of Fukiai Harbor, at a locality on the north shore of Ōsaka-wan, called Yokoya, or Ogi, not shown on available charts. This installation consisted of a 19,600-barrel Diesel oil tank; two 19,600-barrel kerosene tanks; two 40,950- and two 1,000-barrel gasoline tanks; and 2 tanks with a combined capacity of 9,800 barrels. This makes a total storage capacity for 9 tanks of 152,500 barrels. Tankers are reported to anchor some 3 miles offshore in a depth of 32 feet. There was a pipeline with a discharging rate of about 1,000 to 1,400 barrels per hour.

There are reported to be available at the port scores of oil barges, owned by Kawasaki Kisen Kaisha, Tochigi Shoji, and others. The barges range from 1,000 to 1,500 barrels in capacity, and discharge at the rate of about 350 barrels per hour.

3. COAL. From 16,000 to 18,000 tons of Kyūshū Motoyama soft coal are usually on hand. Ships are loaded either alongside a wharf or from lighters. The maximum rate of delivery is estimated by one source as from 30 to 50 tons per hour. Another source reports coaling possible at the rate of 125 tons per hour.

4. ELECTRICITY. There are no facilities for supplying electric current to ships in the port. Most, if not all, of the wharves are, however, supplied with electric current for lighting.

(f) *Repair facilities.*

1. DRYDOCKS. It was announced in the Japanese press, February 1939, that a large new drydock for the accommodation of a 40,000-ton ship was to be built by Mitsubishi Heavy Industries, Ltd. Projected dimensions were as follows: length, 804 feet; width at top, 150 feet; width on bottom, 115 feet; depth at high water, 36 feet. The existence of this new drydock, scheduled for completion about 1941, has not been confirmed. The available data on drydocks are shown in TABLE VI - 26.

*Town plan of Kōbe, Chapter VIII.

TABLE VI - 26

DRYDOCKS AT KŌBE

NAME	STEEL FLOATING DOCK	STEEL FLOATING DOCK
Owned and operated by	Arata Shipyard and Engine Works	Taisho Zosen Tekkosho
Location on waterfront	Believed at quay (Reference ㉕), 850 yds. W of Kawa-saki Signal Station.	Believed at quay (Reference ㉕), 1,010 yds. W of Kawa-saki Signal Station.
Drydock:		
Type	Floating	Floating
Entrance width	45′ 0″	45′ 0″
Body of dock		
Length on keel blocks	—	—
Length on bottom	164′ 0″	140′ 0″
Depth on keel blocks, M.H.W.O.S.T.	12′ 0″	15′ 0″ (on sill)
Mean rise and fall of tide	—	—
Lifting power in tons	600	500

TABLE VI - 26 *Continued*

DRYDOCKS AT KŌBE

Crane service	No data	No data
Largest vessel handled, length, beam, draft	No data	No data
Date built	—	1936
Remarks	—	Sill 2′ 0″ above bottom of dock
NAME	KAWASAKI DRYDOCK	STEEL FLOATING DOCK NO. 1
Owned and operated by	Kawasaki Dockyard Co., Ltd.	Mitsubishi Heavy Industries, Ltd.
Location on waterfront	Kawasaki Dockyard, Kawa-saki	Mitsubishi Dockyard, adjacent on W to outfitting pier (Reference ㊲).
Drydock:		
Type	Graving	Floating
Entrance—		
Width	60′ 6″	60′ 0″
Body of dock—		
Length on keel blocks	337′ 0″	387′ 6″
Length on bottom	426′ 0″	412′ 0″ (overall)
Depth on keel blocks M.H.W.O.S.T.	21′ 0″	22′ 4″
Mean rise and fall of tide	About 4′	
Lifting power in tons		7,000
Crane service	No data	Floating cranes
Largest vessel handled; length, beam, draft	Vessel 410′ long	460′; 56′; 20′.
Date built		1905
Remarks	Sill 1′ 6″ above bottom of dock; entrance width 64′ at coping.	Width 63′ 0″ at coping
NAME	STEEL FLOATING DOCK NO. 2	STEEL FLOATING DOCK NO. 3
Owned and operated by	Mitsubishi Heavy Industries, Ltd.	Mitsubishi Heavy Industries, Ltd.
Location on waterfront	Mitsubishi Dockyard, 200 ft. W of outfitting pier (Reference ㊲)	Mitsubishi Dockyard, 200 ft. W of outfitting pier (Reference ㊴)
Drydock:		
Type	Floating	Floating
Entrance—		
Width	70′ 0″	93′ 0″
Body of the dock—		
Length on keel blocks	505′ 0″	411′ 0″
Length on bottom	532′ 0″ (overall)	470′ 0″ (overall)
Depth on keel bottom, M.H.W.O.S.T.	26′ 0″	30′ 0″
Mean rise and fall of tide	—	—
Lifting power in tons	12,000	16,000
Crane service	Full-portal traveling gantry crane; floating cranes	Floating cranes
Largest vessel handled; length, beam, draft	580′; 66′; 24′.	476′; 89′; 30′.
Date built	1908	1905
Remarks	Width 75′ 6″ at coping	Width 100′ 0″ at coping (FIGURE VI - 96)

2. MARINE REPAIR PLANTS. Large repairs of all kinds can be made by use of the facilities of Mitsubishi Heavy Industries, Ltd., Kawasaki Dockyard Company, Ltd., Taisho Zosen Tekkosho, the Arata Shipyard and Engine Works, and other firms.

The dockyard of the Mitsubishi Heavy Industries, Ltd., at Wada-misaki, covers an area of 120 acres. It is equipped for shipbuilding as well as ship repair, and also for the manufacture of marine engines and for general engineering works (FIGURE VI - 98). In 1936 the employees numbered about 6,350. There are 58 shops, including foundry, smiths', carpenters', boiler, machine, and pattern shops. One of the machine shops is used for the manufacture of internal combustion engines. Adjacent to the northward is the associated works of Mitsubishi Electrical Engineering Co., Ltd., where various types of electrical machinery are produced. This plant covers 4.75 acres and operates also as the electrical department of the dockyard. A floor space of about 150,000 square feet is available.

The dockyard of the Kawasaki Dockyard Company, Ltd., at Kawa-saki is equipped for shipbuilding as well as ship repair, and also produces cement mill machinery, steel structures, machine tools, electrical machinery, fans, penstocks, etc. In 1936 there were about 10,650 employees at this yard, and about 12,350 employees at branch works elsewhere in Kobe. Branch works include a rolling mill, a steel foundry, an aviation works, and a locomotive and car company. The steel foundry and other shops are on the Hyogo Canal, about 2 miles west-southwest of the dockyard. Castings are made here and lightered to the dockyard. The Fukiai Rolling Mill, another branch works, lies east of Fukiai-kō, about 2 miles northeast of the dockyard. This plant is equipped for any kind of casting or plate manufacture.

The Arata Shipyard and Engine Works and Taisho Zosen Tekkosho are believed to be located in Hyogo at a quay (Reference ㉙) westward of the Kawasaki dockyard. No details are available concerning these or other small firms reported engaged in marine repair work.

3. MARINE RAILWAYS. There are 2 marine railways at the Kawasaki dockyard, believed to be located adjacent to the south of the Kawasaki Dockyard Wharf (Reference ㉓). One has a lifting power of 2,000 tons with a cradle 300 feet long and 24 feet wide; the depths on the cradle blocks at high water of ordinary spring tides are 15 feet forward and 24 feet aft. The second has a lifting power of 500 tons, with a cradle 109 feet long and 19½ feet wide; the corresponding depths are 12 feet forward and 18 feet aft.

(7) *Amagasaki* (34° 43′ N, 135° 25′ E).

Amagasaki, the smallest of the 3 ports at the head of Ōsaka-wan, adjoins Ōsaka on the northwest. The town lies about 1 mile upstream from the mouth of the Shoga-kawa, which enters the sea about 1 mile westward of the mouth of the Yodo-gawa. Anchorage is believed available inside the breakwaters in depths over 3½ fathoms and anchorage is available anywhere off the harbor in 6 to 8 fathoms, except during southwesterly winds. Extensive harbor improvements were underway from 1937 to 1940. It is reported that there are facilities for berthing 6 ships drawing up to 30 feet.

(*a*) *Harbor.* Amagasaki-kō is an improved river mouth. Extensive dredging and improvements were in progress as far back as 1937. The Shoga-kawa was dredged to a depth of 30 feet in 1940, and harbor works were under construction along the river mouth and between it and Desuno-hana (FIGURES VI - 99 and VI - 100). A breakwater extends southward from Desuno-hana, a low sandy point, for about 600 yards, and then southeastward for about 750 yards to form a protective arm of the southwestern side of the harbor section. A 1,500-yard detached offshore breakwater was planned to extend in an easterly direction from a point about 850 feet eastward from the ex-

FIGURE VI - 98. *Kōbe.*
Interior of Mitsubishi machine shop at shipyards.

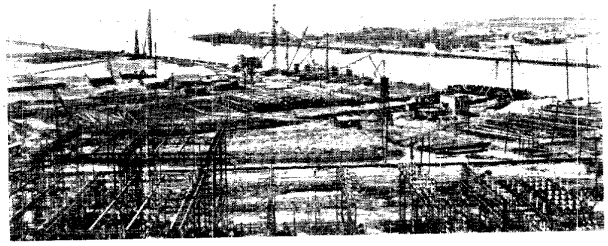

FIGURE VI - 99. *Amagasaki.*
Extreme W side of harbor showing construction and reclamation work in progress, looking northwestward. Power plant transformer yard in foreground.

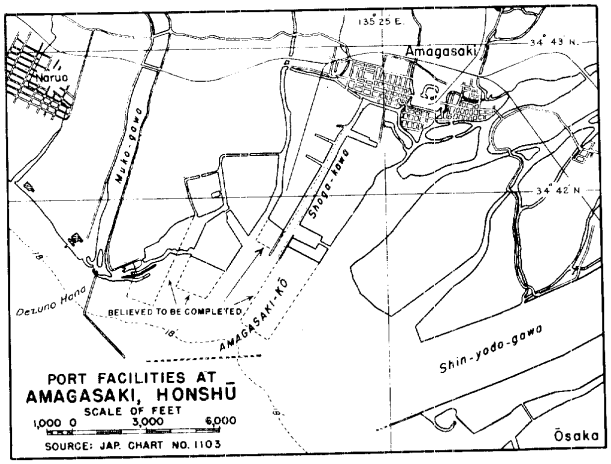

FIGURE VI - 100. *Amagasaki.*
Map of harbor.

tremity of the existing breakwater to form the southern offshore protective arm. With the new breakwater, this section of the harbor water area would be about 370 acres. The charted depths in this part of the harbor range from 2 to 3 fathoms, but it is believed that the present depths are deeper because it has been reported that the channel has been dredged to a depth of 30 feet. How much of the planned work has been completed is not known.

1. ENTRANCE CHANNEL. The entrance southward from the light on the Desuno-hana breakwater, and between it and the proposed offshore breakwater, will be about 850 feet wide. Charted depths were 3½ fathoms. Two confining jetties extend out from the mouth of the Shoga-gawa for about 330 yards.

2. ANCHORAGE. There are no definite data, but it is believed that anchorage can be found inside the breakwaters in depths exceeding 3½ fathoms, over mud bottom. Anchorage can be found most anywhere off the harbor in depths of 6 to 8 fathoms, mud bottom, except during southwesterly winds.

3. TIDES AND CURRENTS. The lunitidal interval is 7 hours, 15 minutes; springs rise 4½ feet, neaps 3½ feet, and the mean tidal level is 3¼ feet. Tidal currents in the vicinity are weak and irregular. Off the port, the tidal current sets southeastward during the flood, and westward during the ebb, with velocities of about ¾ knot and ½ knot, respectively.

4. LOCAL WEATHER. According to observations covering a period of 35 years, the mean temperature in the vicinity is 59°, the maximum 100°, and the minimum 19°. The annual rainfall is 53.94 inches, falling on 139 days. The mean relative humidity is 74 per cent. The prevailing winds are north to northeast, and southwest to west, with some easterly and westerly winds.

(*b*) *Landing facilities.* Recent data are not available. Extensive improvements, including land reclamation for quay sites, were underway in 1937-1940. It is reported that there are facilities for berthing 6 ships drawing not more than 30 feet. It is believed that there are approximately 4,000 linear feet of quays and wharves; about 2,000 linear feet have depths alongside of 30 feet. The known data indicates that the depths alongside the remaining part of the quays and wharves are shallow, not exceeding 12 to 15 feet.

Several traveling coal conveyors, unloaders, and cranes are located at the electric power plant, mainly for use in unloading and handling coal for use in the plant (FIGURE VI - 101).

(*c*) *Storage facilities.* It is believed that there are numerous warehouses in the town and along the industrial section of the reclaimed area, and large and ample open storage areas on the reclaimed areas along the channels.

(*d*) *Capacity and clearance.* Although it is believed that the facilities for berthing deep-draft vessels may be extensive, sufficient data are not available to arrive at an estimate of the unloading capacity.

A branch of the State Railways serves the harbor area, connecting to the main line between Ōsaka and Kōbe, which passes through the town. Roads are believed to lead to and from the industrialized areas along the harbor channels and the wharves, connecting to the coastal highway system. FIGURE VIII - 37*

(*e*) *Supplies.* It is believed that water is available at the wharves. An oil refinery is reported at Amagasaki. This may be the Yutakatoshi Oil Refinery, reported to be northwestward of Desuno-hana. The electric power plant had large stocks of coal on hand, but no data are available regarding commercial storage. The Kansai Co-operative Steam Power Company, Ltd. has a large steam electric power plant at Amagasaki, on reclaimed land at the entrance to the harbor, southwestward of the mouth of the Shogo-kawa, and it is probable that current is available on the wharves.

*Town plan of Amagasaki, Chapter VIII.

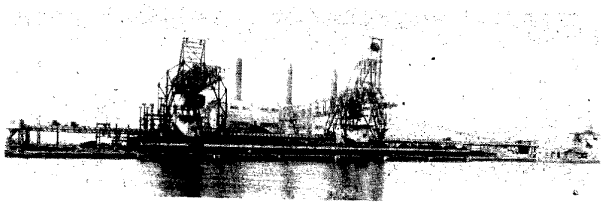

FIGURE VI - 101. *Amagasaki.*
Power plant on Shoga-kawa, looking southeastward, showing coal handling facilities and waterfront prior to enlargement.

(8) Ōsaka (34° 40′ N, 135° 28′ E).

The third of the 3 ports at the head of Ōsaka-wan, Ōsaka is in the northeastern part of Ōsaka-wan, a part of the Inland Sea. The third largest port of Japan and one of the most important industrial centers, Ōsaka can accommodate ships up to 20,000 tons.

Rivers flowing into the harbor are connected by a network of canals. Many of the city's industrial plants are located on the banks of these rivers and canals. The lighters, junks, and sampans plying these waterways are said to handle a volume of commerce almost equal to that carried by the harbor railway system. Much of the cargo passing through the port is handled by lighters to and from ships anchored in the inner harbor.

An extensive program of harbor improvement, started in 1934, is in large part completed. Unlimited anchorage for all types of vessels is available outside the inner harbor in depths up to 7 fathoms. Within the inner harbor, there were 28 mooring berths, including four for 20,000-ton ships, eight for 15,000 ton-ships, and five for 10,000-ton ships. Including berths at wharves, it is estimated that the inner harbor can handle 50 ships of over 5,000 tons.

Exclusive of recent north and south harbor developments, on which detailed information is not available, 38 vessel berths are available at the piers, wharves, and quays on the inner harbor. There are 2 berths for 600-foot vessels drawing 30 feet; 16 berths for 450-foot vessels drawing 26 feet; and 2 berths for 350-foot vessels drawing 26 feet. In addition there are numerous landing facilities on the river-canal interior waterway system; many of these have warehousing and mechanical handling facilities and can accommodate large vessels.

Virtually all the landing facilities on the inner harbor have mechanical handling facilities, including traveling and stationary cranes. A fleet of 500 tugs operates in the harbor and between Ōsaka and Kōbe. In addition, there are over 3,000 lighters and 30 or 40 other motor communication boats at Ōsaka. Other harbor craft include floating cranes, oil tank vessels, and water boats.

Over 300 sheds and warehouses have been reported for the area adjoining the inner harbor. The total storage space is close to 3,000,000 square feet. The extensive land reclamation in progress in recent years is believed to have provided large open storage areas. In addition to the waterways system, adequate railroads and roads are available for clearing cargo. Water, coal, oil, gasoline, and extensive repair facilities also are available.

Sixty-six tanks having a capacity of 666,000 barrels are reported. As a shipbuilding center, Ōsaka has at least 17 drydocks and a number of marine industrial plants.

(*a*) *Harbor.* Ōsaka is built on the delta of the Yodo-gawa, which enters Ōsaka-wan through several shallow mouths. The most important of the delta waterways, from north to south, are: Shin-Yodo-gawa; Shōrenji-gawa; Aji-kawa; Shirinashi-kawa; and Kizu-gawa. The port consists of 2 parts: the inner harbor, enclosed by a system of breakwaters extending along the coast of the Yodo delta; and the outer harbor, comprising a water area outside the breakwaters, as defined by local authorities (FIGURE VI - 102).

An extensive program of harbor works, including extensions of the former limits of the inner harbor to the northward and southward by construction of additional breakwaters, dredging, land reclamation, and wharf construction, was begun in 1934 and is in large part completed. The extension to the northward, or the north harbor, appears to have been nearly completed; the breakwaters protecting the south harbor, which is adjacent on the west to the southern portion of the old inner harbor are known to be in part completed. Work on these breakwaters, and land reclamation within the south harbor, is shown in progress on a chart revised in 1942. The extent of present use of the north and south harbors is not known. Available data on the port are in general limited to the inner harbor prior to the extension work; thus the phrase "inner harbor" is used to describe the water area enclosed by breakwaters to the exclusion of the north and south harbors.

1. HARBOR DEPTHS. Continuous silt discharge by the Yodo-gawa makes it necessary to maintain depths in inner harbor by constant dredging. A depth of 29 feet has been maintained over an area of about 1,200 acres, and a depth of about 32 feet has been maintained over an area of 125 acres. The water area of inner harbor totaled about 1,620 acres prior to recent relocation of the southernmost part of the southern breakwater at about 1,000 feet greater distance from shore. Including this enlargement of the inner harbor and its prolongation southward, as well as the north and south harbors, the total water area to be enclosed by breakwaters built and under construction is estimated at about 3,300 acres. The general depths charted in north and south harbors are 6 to 19 feet, but present depths are believed to be greater as a result of dredging operations. The general depths in the water area outside the breakwaters of the port are from 21 to 37 feet.

2. RIVERS, BASINS, AND CANALS. Umemachi Basin, which opens off the northern side of the inner harbor close westward of the entrance to the Aji-kawa, is about 2,600 feet long and 800 feet wide. The western part of the basin is dredged to depths of 28 to 29 feet. Additional dredging along the eastern side of the basin, where depths of less than 18 feet are charted, is believed to have been completed.

The Aji-kawa is about 1,300 feet wide and was 27 feet deep in its entrance. The channel depths diminished to 18 feet at a point 1,500 yards upstream, where the river is about 700 feet wide. Farther upstream the river narrows considerably. Vessels drawing 14 feet can ascend the Aji-kawa for a distance of 3½ miles.

The Shirinashi-kawa enters the inner harbor about 1¼ miles southeast of the Aji-kawa. Its entrance, 650 feet wide, had a depth of 24 feet; depths of 18 feet are charted for about 500 yards upstream. From this point to the connection with the Kizu-gawa, 2½ miles above the entrance, the minimum charted depths are 4 feet.

The Kizu-gawa enters the inner harbor about 1¼ miles south of the Shirinashi-kawa. From its entrance, about 400 yards wide, to a point about 1½ miles upstream, the charted depths in the middle of the channel range from 13 to 28 feet; the average width of the river is about 750 feet. Farther upstream the river narrows considerably, and the charted depths in the center of the channel as far as its connection with the Aji-kawa, about 5½ miles above the entrance, are generally 6 to 9 feet, with a few shoals about 2 feet deep.

In 1939, a 7-year plan of waterway improvements was under consideration, embracing dredging of the Aji-kawa, Shirinashi-gawa and Kizu-gawa to depths of 10 to 26 feet. A gasoline storage depot at the junction of the Shirinashi-kawa and Kizu-gawa was reported without confirmation in 1941 to be accessible to tankers of 10,500 tons.

The canal system of Ōsaka, which connects these waterways, is extensive and has numerous component parts. Some of the principal canals are:

The Tempōzan Canal, cutting in the northwest – southeast direction across the peninsula between Aji-kawa and Shirinashi-kawa, is 6,900 feet long and 148 feet wide, with a depth in 1934 of 7½ feet at low tide. A branch canal connects it with the slip west of Pier No. 1, (Reference ⑯)* and another with the slip between Piers, Nos. 2 and 3 (References ⑰ ⑲), both branches being 7½ feet deep in 1934.

The Kizu-gawa Canal opens from the inner harbor at a point, 1,400 yards south of the Shirinashi-kawa, and extends eastward 6,000 feet to connect with the Kizu-gawa. This canal is 262 feet wide and was 7½ feet deep in 1934. It was reported to be used for berthing aircraft carriers in 1941, indicating dredging to a greater depth.

From a point about midway in the length of the Kizu-gawa Canal, the Chitose Canal follows a north-northwestward course to connect with the Shirinashi-kawa. The Chitose Canal, 6,260 feet long and 180 feet wide had 7½-foot depths in 1934.

Fukumachibori Canal forms a loop to the westward, connecting with the Chitose Canal at 2 points. The Fukumachibori Canal, 3,465 feet long and 118 feet wide, had 7½-foot depths in 1934.

3. BREAKWATERS. The breakwaters protecting the inner harbor provided inadequate shelter against a violent typhoon on 21 September 1934. The entrance is placed at the point most exposed to the prevailing wind and sea, and the height of the north and south breakwaters, respectively 8½ and 9½ feet above low water, proved insufficient. The program of reconstruction started in 1934 included projects for heightening the existing breakwaters 10 feet and for the extension of the northern breakwater to protect the harbor entrance against westerly seas. It is not known whether the protective structure for the entrance was built. It is believed probable, however, that the height of the old breakwaters was increased where necessary, and that breakwaters subsequently built or under construction enclosing the north and south harbors are likewise constructed to the higher elevation.

In the vicinity of the customhouse, within the inner harbor, 2 breakwaters have been built parallel to and about 300 feet from shore to provide protection for small craft in the intervening basins formed by the structures. One of these breakwaters,

*References are encircled numbers on FIGURE VI - 102.

722 feet long, extends southward from the mouth of the Aji-kawa, and the other, about the same length, extends southeastward from a point about 220 yards farther southward.

Similarly, a lighterage basin about 300 feet wide, extending along the shore of the inner harbor southward from the mouth of the Shirinashi-gawa, is protected by a breakwater 1,493 feet long. To the southward and on the same line as the latter breakwater, a second structure, nearly the same length, is shown on a map dated July 1937, as planned or under construction.

The water area outside the harbor breakwaters is protected by mountain ranges to the northwest and south which afford good shelter from gales from those directions. There is no shelter from the southwest and northeast winds. A typhoon approaching from the southwest has the entire length of the bay in which to rise a dangerous sea and an equally dangerous flood tide.

4. ENTRANCE CHANNEL. The main entrance was between the western tips of the north and south breakwaters enclosing the inner harbor. The bottom width at the entrance was 597 feet, and passage was considered perilous under unfavorable wind and weather conditions. The charted depth at the entrance is 28 feet, and the least charted depth in the ship channel through the inner harbor to the mouth of the Aji-kawa, about 2 miles distant, is 26 feet.

The north harbor has 2 entrances through the newly constructed breakwaters forming the west side of the harbor. The entrances are about 200 and 450 feet wide, and the charted depths, respectively, are 16 and 21 feet. There was a passage for small craft from the south end of Umemachi Basin, on the north side of the inner harbor, to the north harbor, but this is believed to have been temporary in nature and possibly may have been closed by a recent fill. Removal of about 2,500 feet of the breakwater separating the north and inner harbors was included in the proposed harbor works program and has possibly been completed.

The northern portion of the breakwaters forming the western side of the south harbor has been completed, leaving an entrance about 550 feet wide, with charted depths of 16 feet. A second entrance was planned for the southwest corner of the harbor, to be about the same width. The charted depth at this point is about 18 feet. Removal of portions of the south breakwater of the inner harbor to permit passage between the inner harbor and the south harbor was included in the harbor works program. This was to be done on completion of the breakwaters protecting the south harbor. Two passages on the eastern side of the south harbor, one about 300 feet and one about 400 feet wide, provide access from the south harbor to inner harbor at points opposite the entrances to the Shirinashi-kawa and Kizu-gawa.

The depths at the various entrances to the north and south harbors have probably been increased beyond those charted; dredging operations in both harbors were scheduled to begin in 1939.

5. ANCHORAGE. The bottom in both the inner and outer harbors is mud, good holding ground. Unlimited open anchorage is available outside the inner harbor, within and without the harbor limits, for all types of vessels in depths up to 7 fathoms.

Within the inner harbor there were 31 mooring buoys, of which 5 were paired for fore-and-aft mooring, so that the number of ships that could be handled totaled 28. The capacities of the mooring berths were as follows: 4 berths for 20,000-ton ships 649 feet long; 8 berths for 15,000-ton ships 600 feet long; 5 berths for 10,000-ton ships 479 feet long; 11 berths for ships of 4,000 to 6,000 tons, from 367 to 400 feet long. Space was also available near the mooring buoys for a few vessels to moor with 2 anchors, and there are about 7 third-class 360° anchorage berths.

The capacity of the inner harbor, with berths at wharves included, has been estimated at about 50 ships of over 5,000 tons. On 14 February 1939 this harbor was almost crowded to capacity with 63 merchant ships, comprising 21 coastal vessels and 42 ocean-going ships. No data are available on present anchorages in the north and south harbor, but prior to dredging operations at least 15 third-class anchorage berths were available.

6. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water lunitidal interval is 7 hours, 15 minutes. Springs rise 4.59 feet and neaps 3.61 feet above low water of spring tides. Typhoons or gales from the west or southwest cause higher tides than usual, with occasional flooding of the wharves. Flood currents in the inner harbor set inward below the surface stratum, with a velocity not exceeding 0.4 knot; the current flow at the surface is influenced by fresh-water discharge and usually is of opposite direction even at flood tide, with a velocity under 1 knot. During ebb tides the velocity of the surface current setting outward exceeds 1 knot in places, the velocity of the lower stratum generally not exceeding 0.2 knot.

7. LOCAL WEATHER. The monthly mean temperature in August is 81.1°, and in January 39.6°. The average annual rainfall is 53.07 inches, and the mean relative humidity 74 per cent. The prevailing winds are approximately southwesterly in July and August, northeasterly in September and October, and northwesterly during all other months. During a gale from the southwest or west, all lighterage operations at the port are suspended.

(b) Landing facilities.

1. PIERS, WHARVES, AND QUAYS. No data are available on the present extent of progress in wharf construction in the north and south harbors, but considerable land has been reclaimed, and it is probable that extensive quayage for ships has been constructed.

The longest quay in the inner harbor for ships is along the west side of Umemachi Basin (Reference ①), and may have been extended southward to the line of the north breakwater enclosing the inner harbor. Unlike other large previously built quays in the port, which are of open construction, it consists of a concrete wall, backed by a relieving platform reducing the earth pressures tending to overturn it. Whether the shorefront along the east side of the basin (Reference ③) has been similarly developed for the berthage of ships is not known. Sakurashima No. 1 and No. 2 Piers (References ⑥ and ④) and the Tempozan Pier (Reference ⑧) are of open concrete construction (FIGURES VI - 103 and VI - 104). The landing pier (Reference ⑫), formerly the main pier, is of open iron-pile construction and was greatly shortened after partial destruction by and 1934 typhoon (FIGURE VI - 105).

To the eastward of the landing pier a series of quays have been built, numbered consecutively from west to east. Quays Nos. 2 through 7 are on the west and east sides, respectively, of Piers Nos. 1, 2, and 3 (References ⑯, ⑰, and ⑲). There is believed to be no berthage for ships available along the ends of these piers. Except possibly for Quays Nos. 4 and 5 (Reference ⑰),

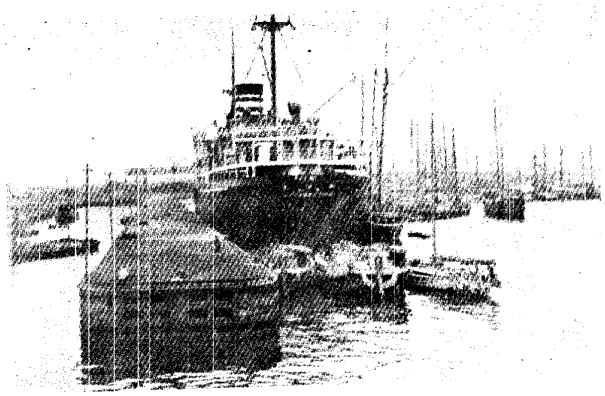

FIGURE VI - 103. *Ōsaka.*
Sakurashima No. 2 Pier (Reference ④), looking north-northeastward, before installation of cranes. Prior to 1930.

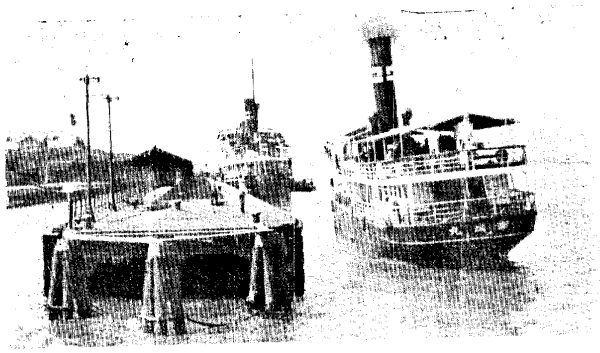

FIGURE VI - 104. *Ōsaka.*
Tempōzan Pier (Reference ⑧), looking southwestward. Prior to 1930.

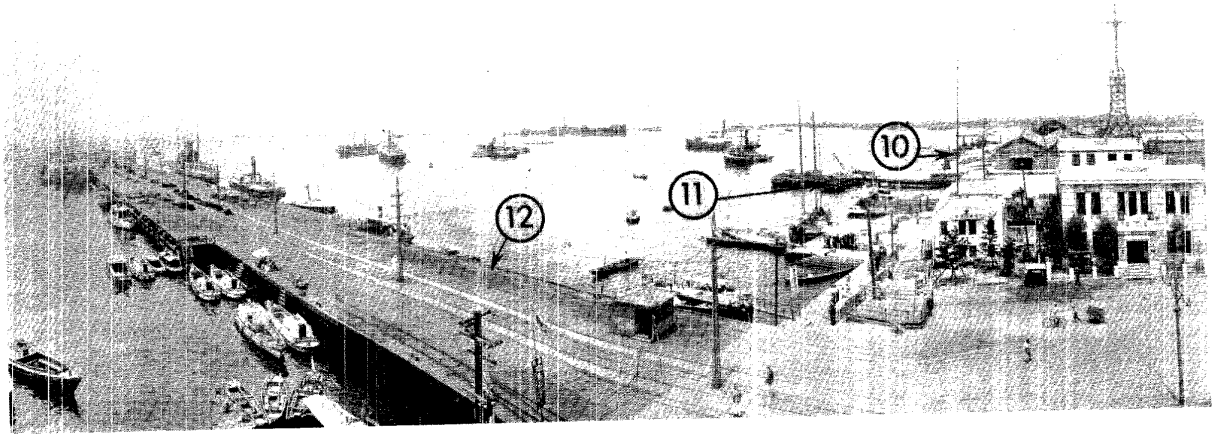

FIGURE VI - 105. *Ōsaka.*
Landing Pier (Reference ⑫), looking northwestward, prior to 1934 typhoon and destruction of outer part. Also shown T-Pier (Reference ⑪) and North Bund Quay (Reference ⑩) prior to construction of breakwater 300 ft. offshore.

the quays are shore wharves of open concrete construction. Quays Nos. 4 and 5 are of more recent construction, and may be of the same type as the quay (Reference ①) along the west side of Umemachi Basin. Quay No. 8 and Shirinashi South Quay (References ⑳ ㉑) are reported to be of iron construction, but may have been rebuilt in concrete.

The principal wharves are well serviced with sheds, warehouses, cranes, water, and lighting, and have highway and railroad connections. The depths alongside these wharves are from 19 to 33½ feet, with most berthage having depths of 29½ feet.

The number of vessel berths according to lengths and vessel drafts is listed in Table VI - 27.

Details of the principal landing facilities are shown in TABLE VI - 28.

TABLE VI - 27

DISTRIBUTION OF VESSEL BERTHS AT ŌSAKA

TOTAL VESSEL BERTHS	VESSEL LENGTHS (FT.)	ALLOWABLE DRAFTS (FT.)	LOCATION BY REFERENCE ON FIGURE VI - 102
2	600	30	⑭ ⑯
16	450	26	① ④ ⑥ ⑫ ⑭ ⑯ ⑰ ⑲
4	450	22	⑳
2	350	26	④ ⑭
3	350	20	⑤ ⑰
1	250	26	①
7	250	16	⑲ ㉑
3	200	12	⑦
38			

TABLE VI - 28

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Reference on FIGURE VI - 102	①	②
NAME	UMEMACHI BASIN, W QUAY.	UMEMACHI BASIN, N QUAY.
Location on waterfront	W side of Umemachi Basin	N side of Umemachi Basin
Owned and operated by	Municipality	Municipality
Purpose for which used	Handling general cargo	Lighterage
Type of construction	Reinforced concrete wall, solid fill on concrete relieving platform.	Reported to be of iron-pile construction
Description:	Bulkhead wharf (ft.)	Shore wharf (ft.)
Dimensions	1,699	840
Depth of water	29½	7½
Berthing space available	1,699	840
Width of apron	Open wharf	Open wharf
Deck above L.L.W.	10½	7¾
Capacity per square foot (lbs.)	Unlimited	Unlimited
Lighted or unlighted	Believed lighted	Believed lighted
Transit sheds:	2	No data
Length and width	300′ by 100′ (each)	No data
Total floor area (sq. ft.)	60,000 (ground floor)	No data
Number of floors	No data	No data
Mechanical handling facilities	2 cranes, believed of traveling bridge type.	2 cranes, believed of traveling bridge type.
Railway connections	1 track on apron, 1,600′ long, 1 track 350′ in rear, 1,500′ long.	1 track 840′ long
Water supply	Fresh water available	Fresh water available
Electric current	No data	No data
Estimated terminal capacity	900	—
Remarks	Quay extension southward planned; three 450-ft. vessels drawing 26′ and one 250-ft. vessel drawing up to 26′ can be berthed.	—

Reference on FIGURE VI - 102	③
NAME	UMEMACHI BASIN, E QUAY.
Location on waterfront	E side of Umemachi Basin
Owned and operated by	Municipality; Mitsui interests
Purpose for which used	No data
Type of construction	No data
Description:	Bulkhead wharf (ft.)
Dimensions	About 2,100 + 350
Depth of water	Shoal
Berthing space available	No data
Width of apron	Open wharf
Deck above L.L.W.	10½
Capacity per square foot (lbs.)	
Lighted or unlighted	Believed lighted
Transit sheds	No data
Mechanical handling facilities	No data

TABLE VI - 28 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Railway connections	No data
Water supply	Fresh water believed available
Electric current	No data
Estimated terminal capacity	—
Remarks	Oil tank farm on upland; a wharf 164′ long, 20′ wide, is believed to be available near end; depth alongside may have been increased for length of quay.

Reference on FIGURE VI - 102	④		
NAME	SAKURASHIMA NO. 2 PIER		
Location on waterfront	N side of Inner Harbor		
Owned and operated by	Mitsui interests		
Purpose for which used	Receipt and shipment of coal; bunkering vessels; handling general cargo.		
Type of construction	Open concrete pile, concrete deck, parallel to shore, with connection to shore at NE end.		
Description:	Face (ft.)	S side (ft.)	N side (ft.)
Dimensions	1,194	33+95	33+95
Depth of water	29½	29 to 6	29 to 6
Berthing space available	1,194	None	None
Width of apron	33		
Deck above L.L.W.	11½		
Capacity per square foot (lbs.)	Large		
Lighted or unlighted	Lighted		
Transit sheds	No data		
Mechanical handling facilities	2 traveling electric straight-line gantry cranes, reach 69′ from pier face, spanning lighter basin between pier and shore; equipped with 4½ cu. yd. grab bucket, or hook as needed; feeding belt conveyor on shore bridge crane.		
Railway connections	One 1,100-ft. track along shore; two 1,100-ft. tracks about 350′ from pier face.		
Water supply	Fresh water available		
Electric current	No data		
Estimated terminal capacity	1,700		
Remarks	Quay along shore, 5½-ft. depth alongside, with coal depot on upland; lighterage basin 1,160′ by 95′ accommodates vessels of 150 to 300 tons; two 450-ft. vessels drawing 26′ and one 350-ft. vessel drawing up to 26′ can be berthed at pier face (FIGURE VI - 103).		

Reference on FIGURE VI - 102	⑤	⑥		
NAME	RAILWAY WHARF (TETSUDO SAMBASHI)	SAKURASHIMA NO. 1 PIER		
Location on waterfront	N side of inner harbor	N side of entrance to Aji-kawa		
Owned and operated by	Mitsui interests	Mitsui interests		
Purpose for which used	Receipt and shipment of coal; bunkering vessels.	Receipt and shipment of coal; bunkering vessels; handling general cargo.		
Type of construction	Concrete wall, retaining solid fill.	Formerly iron pile, timber deck; believed rebuilt of concrete piles and deck.		
Description:	Bulkhead wharf (ft.)	Face (ft.)	W side (ft.)	E side (ft.)
Dimensions	1,100	896	36+85	36+85
Depth of water	21	29½	—	—
Berthing space available	748	896	None	None
Width of apron	Open wharf	36		
Deck above L.L.W.	7½	9½		

TABLE VI - 28 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Capacity per square foot (lbs.)	Unlimited	No data
Lighted or unlighted	Unlighted	Lighted
Transit sheds	No data	No data
Mechanical handling facilities	3 traveling electric straight-line gantry cranes, equipped with grab buckets.	No data
Railway connections	One 800-ft. track parallel to and 50′ from quayside	One 896-ft. track parallel to and about 170′ from wharf face
Water supply	No data	Fresh water available
Electric current	No data	No data
Estimated terminal capacity	1,000	1,200
Remarks	Coal depot on upland; two 350-ft. vessels drawing 20′ can be berthed.	Warehouses on upland; two 450-ft. vessels drawing 26′ can be berthed.

Reference on FIGURE VI - 102	⑦	⑧			⑨
NAME	SAKURASHIMA-KATA WHARF	TEMPOZAN PIER			QUAY (ENGAN BOEKI CHINAI)
Location on waterfront	N bank of Aji-kawa, on line of Tempōzan Canal extended.	S bank of Aji-kawa, 200 yds. W of entrance to Tempōzan Canal.			S bank of Aji-kawa, 335 yds. W of entrance to Tempōzan Canal.
Owned and operated by	No data	Municipality			Municipality
Purpose for which used	Lighterage	Handling passengers and general cargo in coastwise trade			Lighterage
Type of construction	Believed to be reinforced concrete wall, retaining solid fill.	Open concrete pile, concrete deck.			Masonry wall, solid fill.
Description:	Bulkhead wharf (ft.)	Face (ft.)	W side (ft.)	E side (ft.)	Bulkhead wharf (ft.)
Dimensions	614 + 900	581	90	30 + 60	925
Depth of water	14 and 6	19	—	30 + 60	9½
Berthing space available	614 + 745	581	None	None	925
Width of apron	25	30			50
Deck above L.L.W.	5½	8½			No data
Capacity per sq. ft. (lbs.)	Unlimited	Large			Unlimited
Lighted or unlighted	No data	Lighted			No data
Transit sheds	No data	No data			No data
Mechanical handling facilities	No data	None			Six 1½-ton traveling cranes, Diesel-operated.
Railway connections	One 500-ft. track parallel to and 200′ from 614′ quayside section, in rear of warehouses.	None			One 925-ft. track, parallel to and 120′ from quayside.
Water supply	No data	Fresh water available			No data
Electric current	No data	No data			No data
Estimated terminal capacity	750	500			—
Remarks	Warehouses in rear of wharf; Three 200-ft. vessels drawing 12′ can be berthed.	Sheds on upland; open pavilion on pier; two 250-ft. vessels drawing 16′ can be berthed (FIGURE VI - 104).			Numerous sheds on upland; Pier similar to Tempōzan Pier (Reference ⑧), and roughly 800′ long planned or under construction off quay.

Reference on FIGURE VI - 102	⑩	⑪
NAME	NORTH BUND QUAY (KITAKAIGAN-DORI)	T-PIER
Location on waterfront	S of entrance to Aji-kawa	700′ S of entrance to Aji-kawa
Owned and operated by	Municipality	Municipality

TABLE VI - 28 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Purpose for which used	Lighterage	Lighterage
Type of construction	Masonry wall, solid fill.	Iron piles, timber deck
Description:	Bulkhead wharf (ft.)	Face (ft.) / N side (ft.) / S side (ft.)
Dimensions	600	105 / 15 + 85 / 15 + 85
Depth of water	9½	14 / — / —
Berthing space available	500	105 / None / None
Width of apron	100	15
Deck above L.L.W.	6½	6½
Capacity per sq. ft. (lbs.)	Unlimited	No data
Lighted or unlighted	Lighted	Unlighted
Transit sheds	No data	None
Mechanical handling facilities	2 stationary rotating electric 2½-ton cranes	1 shear-leg crane
Railway connections	Trackage parallel to and 175′ from quayside	One 100-ft. track on pier
Water supply	None	None
Electric current	No data	No data
Estimated terminal capacity	—	—
Remarks	Connection from quay to breakwater 300′ offshore, not known to be usable for berthing; numerous sheds on upland (FIGURE VI - 105).	200-ft. quay, with 9½-ft. depth alongside, adjacent to S (FIGURE VI - 105).

Reference on FIGURE VI - 102	⑫	⑬
NAME	LANDING PIER	SOUTH BUND QUAY (MINAMIKAIGAN-DORI)
Location on waterfront	1,100′ S of entrance to Aji-kawa	1,225′ S of entrance to Aji-kawa
Owned and operated by	Municipality	Municipality
Purpose for which used	Handling general cargo and passengers	Lighterage
Type of construction	Iron piles, timber deck.	Masonry wall, solid fill.
Description:	Face (ft.) / N side (ft.) / S side (ft.)	Bulkhead wharf (ft.)
Dimensions	90 / 627 + 180 / 627 + 180	300 + 1,400 (approx.)
Depth of water	27½ / 27½ / 27½	6 to 7½
Berthing space available	90 / 627 / 627	300 + 1,400
Width of apron	Open wharf	55
Deck above L.L.W.	8¾	No data
Capacity per sq. ft. (lbs.)	No data	Unlimited
Lighted or unlighted	Lighted	Lighted
Transit sheds	None	No data
Mechanical handling facilities	None	No data
Railway connections	4 tracks, total length 3,200′.	Trackage believed available parallel to and 190′ from quayside
Water supply	Fresh water available	No data
Electric current	No data	No data
Estimated terminal capacity	1,200	—
Remarks:	Pier shortened to present length after 1934 typhoon; inner 180′ of pier is 59′ wide; two 450-ft. vessels drawing 26′ can be berthed (FIGURE VI - 105).	Numerous sheds on upland; connection from quay to breakwater 250′ offshore, not known to be usable for berthing.

TABLE VI - 28 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Reference on FIGURE VI - 102	⑭
NAME	QUAY NO. 1
Location on waterfront	3,700′ WNW of entrance to Shirinashi-kawa
Owned and operated by	Municipality; Sumitomo Warehouse Co., Ltd.
Purpose for which used	Handling general cargo
Type of construction	Shore wharf with open concrete columns, concrete asphalt-paved deck, partially supporting sheds.
Description:	Bulkhead wharf (ft.)
Dimensions	1,430 + 196
Depth of water	33½ to 29½ to 8
Berthing space available	1,430 + 196
Width of apron	22
Deck above L.L.W.	11½
Capacity per sq. ft. (lbs.)	Large
Lighted or unlighted	Lighted
Transit sheds:	Of 9 planned, 5 constructed
Type of construction	Steel and corrugated iron
Length and width	119′ by 149′; 134′ by 149′; 134′ by 149′; 2 irregularly shaped sheds.
Total floor area (sq. ft.)	98,800 (ground floor)
Number of floors	2 (2nd floor set back 9′)
Mechanical handling facilities	Traveling electric semi-portal straight-line cranes of small capacity; cargo masts; monorail cranes on second floor ceiling; tractors and trailers.
Railway connections	2 depressed tracks in rear of transit sheds, total length 3,200′.
Water supply	Fresh water available
Electric current	No data
Estimated terminal capacity	1,800
Remarks:	Of 9 planned warehouses in rear of transit sheds, three 5-story warehouses are known to have been built; one 600-ft. vessel drawing 30′, one 450-ft. vessel drawing 26′, and one 350-ft. vessel drawing up to 26′ can be berthed (FIGURE VI - 106).

Reference on FIGURE VI - 102	⑮
NAME	QUAY
Location on waterfront	2,950′ NW of entrance to Shirinashi-kawa
Owned and operated by	Municipality
Purpose for which used	Lighterage
Type of construction	Masonry wall, solid fill.
Description:	Bulkhead wharf (ft.)
Dimensions	600 + 260 + 575
Depth of water	About 7½
Berthing space available	600 + 575
Width of apron	Open wharf
Deck above L.L.W.	No data
Capacity per sq. ft. (lbs.)	Unlimited
Lighted or unlighted	No data
Transit sheds:	No data
Type of construction	No data

TABLE VI - 28 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Length and width	No data		
Total floor area (sq. ft.)	No data		
Number of floors	No data		
Mechanical handling facilities	No data		
Railway connections	None		
Water supply	None		
Electric current	No data		
Estimated terminal capacity	—		
Remarks	Quayage on canal entering to W not included		

Reference on FIGURE VI - 102 ⑯

NAME PIER NO. 1 (QUAYS NOS. 2 AND 3)

Location on waterfront: 2,400′ WNW from entrance to Shirinashi-kawa

Owned and operated by: Municipality

Purpose for which used: Handling general cargo; face quay and SE side believed for lighterage.

Type of construction: Solid-fill pier, bordered on sides by shore wharves of open concrete columns, concrete deck; masonry wall on face.

Description:	Face (ft.)	NW side (ft.)	SE side (ft.)
Dimensions	550	1,120	About 850
Depth of water	10 to 7	33½ to 29½	6 to 3
Berthing space available	No data	1,120	About 700
Width of apron	No data	20	30

Deck above L.L.W.	11½
Capacity per square foot	Large
Lighted or unlighted	Lighted
Transit sheds:	9
Type of construction	Steel and corrugated iron
Length and width	No data
Total floor area	No data
Number of floors	1
Mechanical handling facilities	Two 3-ton and one 35-ton stationary electric crane on SE side and traveling electric cranes on NW side
Railway connections	One 800-foot track on east apron; 3 spurs ending at west apron.
Water supply	Fresh water available
Electric current	No data
Estimated terminal capacity	1,200
Remarks	NW side of pier affords berths for one 600-ft. vessel drawing 30′, one 450-ft. vessel drawing 26′.

Reference on FIGURE VI - 102 ⑰

NAME PIER NO. 2 (QUAYS NOS. 4 AND 5)

Location on waterfront: 1,400′ WNW from entrance to Shirinashi-kawa

Owned and operated by: Municipality

Purpose for which used: Handling general cargo; face quay and NW side believed for lighterage.

Type of construction: Solid-fill pier, believed to be bordered on sides by shore wharves of open concrete columns, concrete deck; masonry wall on face.

Description:	Face (ft.)	NW side (ft.)	SE side (ft.)

TABLE VI - 28 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Dimensions	500	About 850	1,148
Depth of water	About 15	6 to 0	28 to 25
Berthing space available	No data	850	1,148
Width of apron	No data	No data	No data
Deck above L.L.W.	No data		
Capacity per sq. ft. (lbs.)	Large		
Lighted or unlighted	Lighted		
Transit sheds:	7		
Type of construction	Steel and corrugated iron		
Length and width	No data		
Total floor area	No data		
Number of floors	No data		
Mechanical handling facilities	Cranage believed installed		
Railway connections	Trackage believed available		
Electric current	No data		
Water supply	Fresh water believed available		
Estimated terminal capacity	1,300		
Remarks	SE side of pier affords berths for one 450-ft. vessel drawing 26′, one 350-ft. vessel drawing 20′, and one 250-ft. vessel drawing 16′.		

Reference on FIGURE VI - 102	⑱	⑲		
NAME	QUAY	PIER NO. 3 (QUAYS NOS. 6 AND 7)		
Location on waterfront	N of pier forming W entrance point to Shirinashi-kawa	At W entrance point to Shirinashi-kawa		
Owned and operated by	Municipality	Municipality		
Purpose for which used	Lighterage	Handling general cargo; face quay believed for lighterage.		
Type of construction	Masonry wall, solid fill.	Solid-fill pier, bordered on sides by 60-ft. wide shore wharves of open concrete columns, concrete deck; masonry wall on face.		
Description:	Bulkhead wharf (ft.)	Face (ft.)	NW side (ft.)	SE side (ft.)
Dimensions	675 + 200 + 325	660	1,178	1,178
Depth of water	About 11	29½	29½	29½
Berthing space available	675 + 325	No data	1,178	1,178
Width of apron	No data	No data	20	30
Deck above L.L.W.	No data	11½		
Capacity per sq. ft. (lbs.)	Unlimited	Large		
Lighted or unlighted	No data	Lighted		
Transit sheds:	No data	12		
Type of construction		Steel and corrugated iron		
Length and width		No data		
Total floor area		No data		
Number of floors		8 sheds 1-story; 4 sheds 2-story.		
Mechanical handling facilities	No data	Small traveling electric cranes		
Railway connections	None	One 1,150-ft. track in rear of transit sheds on Quay No. 7; 3 spurs ending at Quay No. 6.		

TABLE VI - 28 *Continued*

PIERS, WHARVES, AND QUAYS AT ŌSAKA

Water supply	None	Fresh water available
Electric current	No data	No data
Estimated terminal capacity	—	3,000
Remarks	—	Pier 541′ wide; four 450-ft. vessels drawing 26′ and two 250-ft. vessels drawing 16′ can be berthed at Quays Nos. 6 and 7 (FIGURES VI - 107, VI - 108, and VI - 109).
Reference on FIGURE VI - 102	⑳	㉑
NAME	QUAY NO. 8	SHIRINASHI SOUTH QUAY (SHIRINASHI MINAMI-KESANGAN)
Location on waterfront	On NW bank of Shirinashi-kawa, opposite E entrance point.	On SE bank of Shirinashi-kawa, E of entrance.
Owned and operated by	Municipality	Municipality; Kaishima Shogyo Co.
Purpose for which used	Handling general cargo	Receipt and shipment of coal; bunkering vessels.
Type of construction	Reported to be of iron-pile construction	Reported to be of iron-pile construction
Description:	Shore wharf	Bulkhead wharf
Dimensions	1,102 (ft.)	1,112 (ft.)
Depth of water	24½	19 to 6 (See "Remarks")
Berthing space available	1,102	1,112
Width of apron	Open wharf	Open wharf
Deck above L.L.W.	10¾	8½
Capacity per sq. ft. (lbs.)	No data	Large
Lighted or unlighted	Lighted	Unlighted
Transit sheds	Several sheds believed available	No data
Mechanical handling facilities	Cranage believed installed	1 large traveling electric straight-line gantry crane, equipped with a grab bucket, reaches from quayside about 70′.
Railway connections	Trackage available in rear of quay	Trackage believed available in rear of wharf
Water supply	Fresh water available	Fresh water available
Electric current	No data	No data
Estimated terminal capacity	1,200	500
Remarks	Two 450-ft. vessels drawing up to 22′ can be berthed.	597′ of wharf reported to have 19-ft. depth; two 250-ft. vessels drawing 16′ can be berthed; 2 mooring buoys off wharf (FIGURE VI - 110).

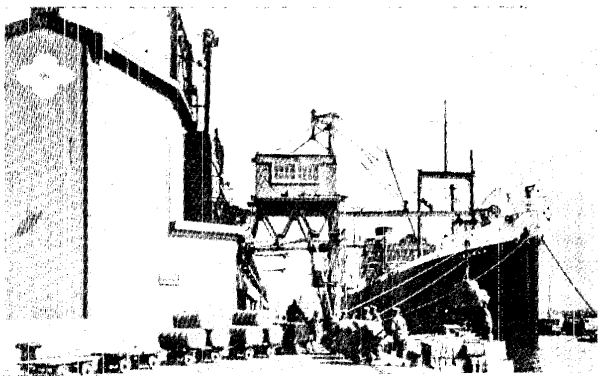

FIGURE VI - 106. *Ōsaka.*
Quay No. 1 (Reference ⑭), looking east-northeastward.

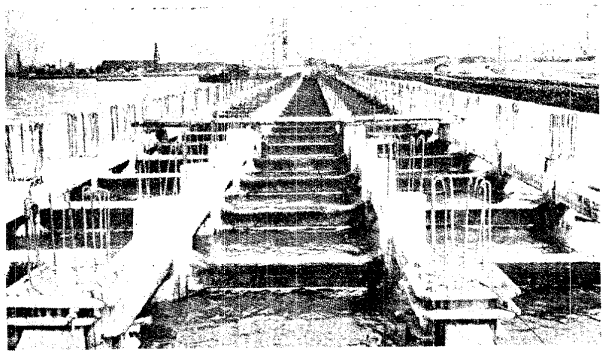

FIGURE VI - 107. *Ōsaka.*
Quay No. 6, NW side of Pier No. 3 (Reference ⑲), looking east northeastward. Under construction in 1926.

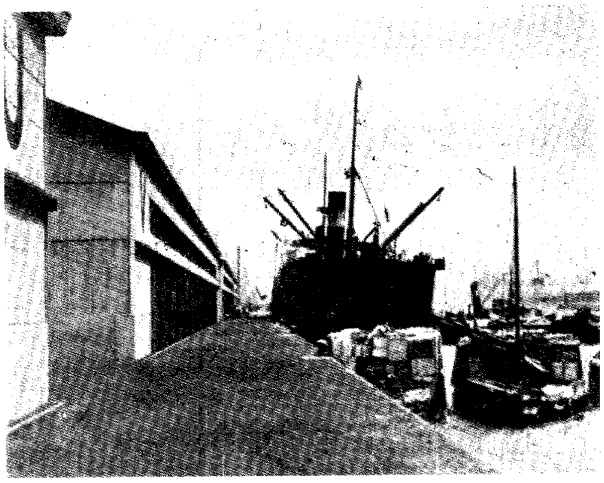

FIGURE VI - 108. *Ōsaka.*
Quay No. 7, SE side of Pier No. 3 (Reference ⑲), looking east-northeastward. 1930.

2. OTHER LANDING PLACES. Behind the 1,493-foot breakwater which extends southward from the mouth of the Shirinashi-kawa at about 300 feet distance from shore, there is a basin for lighters with a depth of 7½ feet. The shore behind this breakwater, and to the southward, is believed to be quayed and used for handling cargo to and from warehouses on the waterfront.

There are numerous industrial, commercial, and municipal wharves on the interior waterway system, some of which are accessible to sizable craft. According to an unconfirmed report, a wharf at a gasoline storage installation located at the intersection of the Shirinashi-kawa and Kizu-gawa could accommodate 3 tankers of 10,500 tons each in 1941.

Along the Kizu-gawa Canal are the wharves of numerous industrial establishments, such as the General Motors assembly plants, the Mitsubishi oil storage installations, and a plant of the Osaka Iron Works (FIGURES VI - 111, through VI - 113). Some of these wharves appear to be able to accommodate ships, if sufficient depth has been provided alongside. Aircraft carriers were reported to be berthed in the canal in 1941. Wharves equipped with coal-unloading cranes are located at steam power plants on the Aji-kawa and Kizu-kawa. A large cement mill operated by the Asano Portland Cement Company, located on the left bank of the Kizu-gawa close above the Kizu-gawa Canal, has a large wharf equipped with 3 traveling electric straight-line semiportal cranes, 2 small cranes, and 2 belt conveyors (FIGURE VI - 114). The several lighter wharves on the interior waterway system, which serve adjacent warehouses, are equipped with cranes of various types.

3. MECHANICAL HANDLING FACILITIES. It is reported that the wharves in the port, including those operated by private concerns, are well equipped with cranes, both stationary and traveling. Available data on details of cranage are fragmentary and almost entirely limited to a few of the municipally operated cranes located on wharves in inner harbor. Many of the numerous wharves serving commercial and industrial establishments on the waterway system extending inland through the city are also equipped with cranes of various types (FIGURE VI - 114). The available details of shore hoisting facilities on the wharves in inner harbor are shown in TABLE VI - 29.

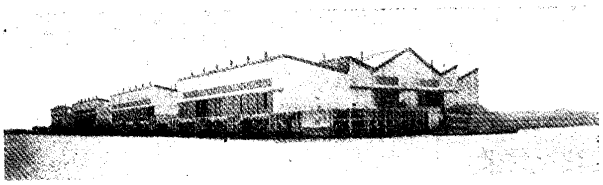

FIGURE VI - 109. *Ōsaka.*
Outer end of Quay No. 6, NW side of Pier No. 3 (Reference ⑲), looking east-northeastward. About 1929.

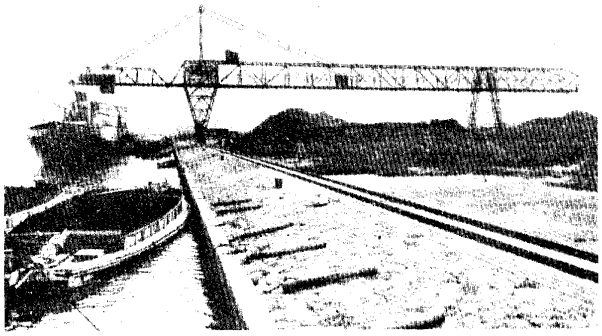

FIGURE VI - 110. *Ōsaka.*
Coal wharf (Reference ㉑). Prior to 1930.

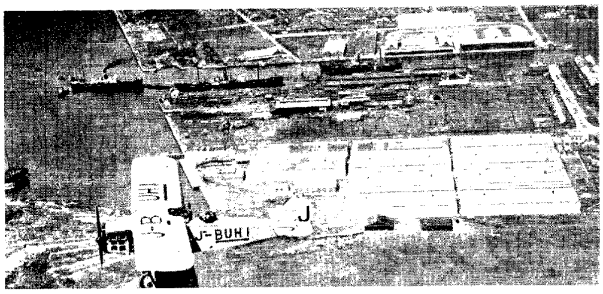

FIGURE VI - 111. *Ōsaka.*
Entrance from SE part of harbor into Kizugawa Canal, looking northward.

Other cranage in the port consists of shipyard cranes, cranes used for handling seaplanes at the seaplane base between the Kizu-gawa and the Kizu-gawa Canal, and floating cranes. The Sumitomo Warehousing Company, Ltd. operated a floating crane with a capacity of at least 10 tons.

Details of 3 floating cranes operated by the municipality are shown in TABLE VI - 30.

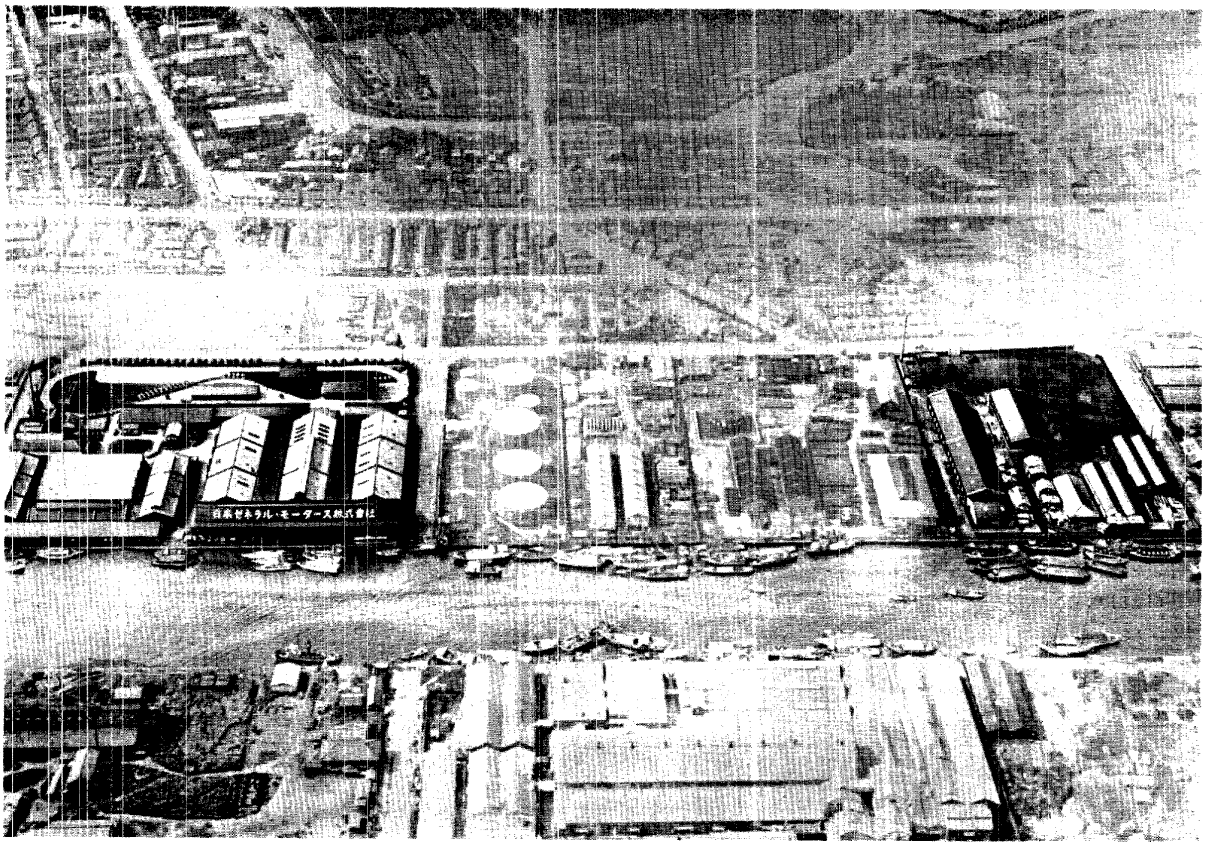

FIGURE VI - 112. *Ōsaka.*
Aerial showing mid-portion of Kizugawa Canal, looking north-northwestward. Top right SE end of Chitose Canal joins with Fukumachidori Canal, top left and center, to extend southeastward to Kitsugawa Canal. Mitsubishi oil storage tanks in center. General Motors plant center left and right. Prior to 1937.

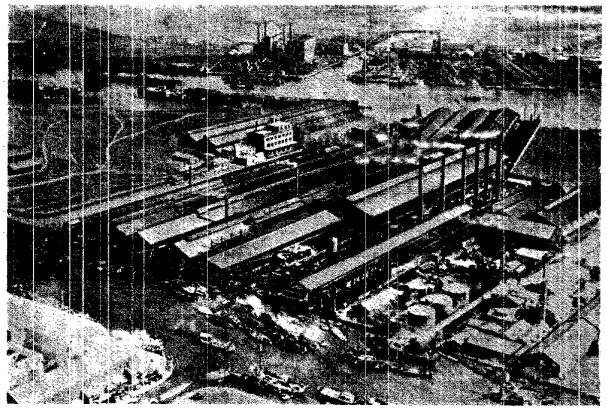

FIGURE VI - 113. *Ōsaka.*
Nakayama Steel Works near point where Kizugawa Canal joins Kizugawa river. 1935.

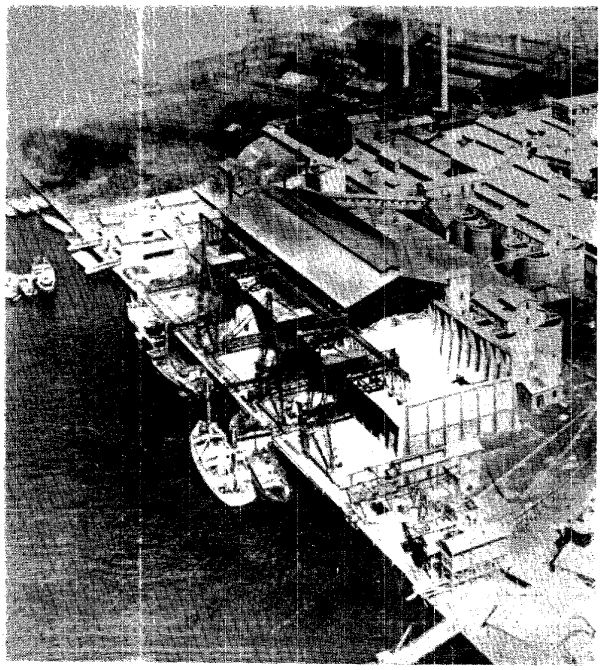

FIGURE VI - 114. *Ōsaka.*
Wharves and cranes of Asano Portland Cement plant, on Kizu-gawa above point where canal joins river.

TABLE VI - 29

HOISTING FACILITIES ASHORE AT ŌSAKA

NUMBER AND KIND	LIFT CAPACITY TONS	POWER USED	BERTHING SPACE AVAILABLE LENGTH (FT.)	BERTHING SPACE AVAILABLE DEPTH (FT.) M.L.W.	LOCATION AND REFERENCE ON FIGURE VI - 102	REMARKS
2 cranes	No data	No data	1,699	29½	Umemachi Basin W Quay (Reference ①)	Believed of traveling bridge type
2 cranes	do	do	840	7½	Umemachi Basin N Quay (Reference ②)	do
2 traveling straight-line gantry cranes	Large	Electric	1,194	29½	Sakurashima No. 2 Pier (Reference ④)	Used with 4½ cu. yd. grab buckets for handling coal, or hook for general cargo; reach from stringpiece, 69′ (FIGURE VI - 103).
3 traveling straight-line gantry cranes	do	do	748	21	Railway wharf (Reference ⑤)	Used for handling coal
6 traveling cranes	1½	Diesel	925	9½	Quay (Reference ⑨)	—
2 stationary rotating cranes	2½	Electric	500	9½	North Bund Quay (Reference ⑩)	—
1 shear-leg crane	No data	No data	105	14	T-pier (Reference ⑪)	—
Traveling semi-portal straight-line gantry cranes	Small	Electric	1,430	33½ to 29½	Quay No. 1 (Reference ⑭)	Cranes worked in conjunction with monorail system mounted on 2nd floor ceiling of adjacent sheds and warehouses (FIGURE VI - 106).
Traveling cranes	Small	Electric	1,120	33½ to 29½	Quay No. 2, Pier No. 1 (Reference ⑮)	—
2 stationary cranes 1 stationary crane	3 35	Electric) Electric)	850	18	Quay No. 3, Pier No. 1 (Reference ⑯)	—
Cranes	No data	No data	1,998	28 to 18	Pier No. 2 (Reference ⑰)	Cranes believed recently installed
Traveling cranes	Small	Electric	2,356	29½	Pier No. 3 (Reference ⑲)	—
Cranes	No data	No data	1,102	24½	Quay No. 8 (Reference ⑳)	Cranes believed recently installed
1 traveling straight-line gantry crane	Large	Electric	597	19	Shirinashi south quay (Reference ㉑)	Reach from quayside about 70′; equipped with grab bucket, for coal handling (FIGURE VI - 110).

FIGURE VI - 115. *Ōsaka.*
Types of tugs and lighters used in cargo transfer.

TABLE VI - 30

HOISTING FACILITIES AFLOAT AT ŌSAKA

NUMBER AND KIND	LIFT CAPACITY (TONS)	POWER USED	REMARKS
1 crane with 2 arms	45 and 30	Steam	1 arm lifts 69′ above the water; the second, 56′.
1 crane	20	Steam	—
1 crane	10	Steam	—

4. HARBOR CRAFT. A large fleet of about 500 tugs operate in the waters of the port and between Ōsaka and Kōbe (FIGURE VI - 115). These included 6 municipal tugs, described in TABLE VI - 31.

TABLE VI - 31

MUNICIPAL TUGS OPERATING AT ŌSAKA

NAME	PROPULSION	GROSS TONNAGE	BRAKE HORSE POWER
Yamaro Maru	Steam	187	742
Kanzaki Maru	Diesel	180	1,272
Shinshimizu Maru	Steam	56	200
Wakamizu Maru	Steam	32	140
Tamamizu Maru	Diesel	51	165
Misaki Maru	Diesel	66	310

The 2 largest tugs were equipped for fire fighting with searchlights, electric pumps of about 50,000 gallons per hour capacity, and 2,385 feet of hose each. There were over 3,000 lighters and 30 or 40 communication boats, most of the latter being motorboats. Of these, 4 were municipal ferries operating across the mouth of the Aji-kawa. Miscellaneous harbor craft included floating cranes, oil tank vessels, and water boats.

(*c*) *Storage facilities.* No data are available on grain elevators, but Ōsaka is the rice market for Japan and the principal port handling this commodity.

The numerous sheds and warehouses in the port are not confined in their location to the main wharves; many are located on reclaimed land in the rear of lighterage facilities along the inner harbor, and on the interior waterway system (FIGURE VI-116). At the end of 1928 there were 804 commercial warehouses in the port, with a total floor space of about 4,346,000 square feet, controlled for the most part by 5 principal warehousing companies. Warehouse storage space is believed to have been greatly increased during the interim period. Multistory concrete construction is commonly found. A group of large warehouses for government use are located to the southward of the west entrance to the Kitsugawa Canal. Except possibly for these structures, the warehouses in that part of the port adjacent to the inner harbor are all served with railroad sidings and have highway connections. These establishments, together with the warehouses on the interior waterway system, are believed to be well equipped with cranes, hoists, and cargo-handling equipment, including carts, tractors, trailers, belt conveyors, etc.

The largest concentration of sheds and warehouses is in the vicinity of the North and South Bund Quays (References ⑩ ⑬). A tabulation of these and of sheds and warehouses located along and in close proximity to the inner harbor is shown, as of 1939, in TABLE VI-32. It is not known whether the data are exclusive of structures on Quays Nos. 1 to 8 (References ⑭ ⑯ ⑰ ⑲ ⑳).

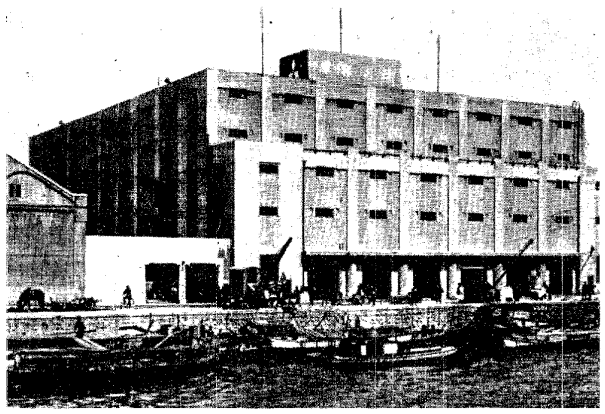

FIGURE VI - 116. *Ōsaka.*
Mitsubishi warehouse on Yodo-gawa in NE part of Osaka, showing wharves and cranes. Prior to 1935.

TABLE VI - 32

SHEDS AND WAREHOUSES IN THE PORT AREA ADJOINING THE INNER HARBOR AT ŌSAKA.

LOCATION	TOTAL NO. OF BLDGS.	TOTAL BUILDING AREA (SQ. FT.)	MUNICIPAL		PRIVATE	
			NO. OF BLDGS.	BUILDING AREA (SQ. FT.)	NO. OF BLDGS.	BUILDING AREA (SQ. FT.)
			Sheds			
Umemachi and Sakurajima, N side of inner harbor	14	275,547	4	114,001	10	161,546
In vicinity of N and S Bunds to S of Aji-kawa	29	660,382	19	449,967	10	210,415
Along banks of Tempōzan Canal	2	19,084	—	—	2	19,084
Totals sheds	45	955,013	23	563,968	22	391,045
			Warehouses			
Umemachi and Sakurajima, N side of inner harbor	46	349,797	2	49,320	44	300,477
In vicinity of N and S Bunds to S of Aji-kawa	132	1,187,915	—	—	132	1,187,915
Along banks of Tempōzan Canal	69	405,922	1	10,323	68	395,599
E side of inner harbor, between Shirinashi-kawa and Kizu-gawa Canal	14	69,395	—	—	14	69,395
Totals of warehouses	261	2,013,029	3	59,643	258	1,953,386
Totals, sheds and warehouses	306	2,968,042	26	623,611	280	2,344,431

As a result of extensive land reclamation on the north and east sides of north harbor and around Umemachi Basin (References ① to ③), large areas of open storage space are available at these localities. The area of open space bordering Umemachi Basin totals at least 70 acres, and is adequately served by rail and highway. Open space currently used for coal storage is available in the rear of Sakurajima No. 2 Pier and the Railway wharf (References ④ ⑤).

Pier No. 2 (Reference ⑰) has an area of about 10 acres. The extent to which this area has been covered by structures is not known. Railway sidings and highway connections are available. The area in the rear of Shirinashi South Quay (Reference ㉑), currently used for coal storage, and along the waterfront to the south of the Shirinashi-kawa are believed to be usable to some extent for open storage. This area is adequately served by highways, and rail sidings are believed available.

Large areas may have been made available in south harbor by recent land reclamation along its eastern side. There are no known rail or highway connections from these areas to the mainland. Such connections are possible, however, at the southeastern corner of the harbor, where a tract of over 200 acres is indicated on the latest available chart as being reclaimed.

(*d*) *Capacity and clearance.* The unloading capacity of the port is estimated at 16,250 short tons per day. It is reported that the 2 harbor railway systems handled a total of 2,303,745 tons of cargo in 1934, but that the potential capacity is greatly in excess of this figure.

The available data on foreign and domestic commerce, for the year 1934, are shown in TABLE VI - 33.

TABLE VI - 33

RECEIPTS AND SHIPMENTS AT ŌSAKA, 1934.

(000 omitted)

TOTALS		RECEIPTS		SHIPMENT	
Tons	Yen	Tons	Yen	Tons	Yen
22,418	3,764,284	16,166	1,798,068	6,252	1,966,216

The foreign trade consisted principally of: imports of lumber, coal, iron and steel, metals, ores, raw cotton, cotton seed, oil hides and skins, industrial chemicals, fodders, fertilizers, and foodstuffs; and exports of cotton piece goods, cotton yarn, machinery, artificial silk textiles and yarn, woolen textiles and knitted goods, glass and glass manufactures, iron manufactures, papers, industrial chemicals, and cement.

The clearance facilities are adequate, including coastal and canal transportation, railroads, highways, and air. (FIGURE VIII - 108).*

The Aji-kawa, Shirinashi-kawa, and Kizu-gawa have connections to the Yodo-gawa waterway system, which is navigable for river boats throughout its length to its source in Biwa-ko (Lake Biwa), about 35 miles northeast of the mouth of the Aji-kawa. The depth of water at the connection of the Yodo-gawa with the Kizu-gawa is 6 feet, while the depth above this point varies from 4 to 10 feet.

At Kema, the connection of the interior waterway system of Ōsaka with the Yodo-gawa, there is a diversion dam regulating the flow of water through the Ōsaka waterways and diverting flood waters through the channel of the Shin-Yodo-gawa (New Yodo River), which enters the bay to the northward of the harbor. The lock adjoining the dam has a working length of 268 feet and a width of 39 feet. Regulation of water flow in the Ōsaka waterways also is handled by 5 movable dams at various points in the city, with locks for river craft.

The Dojimagawa Lock, located on the main waterway through the center of the city, is 200 feet long, 40 feet wide, and has depths at low water of 8 feet along the center line and 6 feet along the sides. The Ōsaka waterfront is connected to the main railroad system by 2 lines: the Nishinari line, which serves Umeshima, Sakurajima, and the waterfront along the north bank of the Aji-kawa, and connects with the main line at Ōsaka station; and the Rinko line, which serves the wharves to the southward of the Aji-kawa, crossing both the Shirinashi-kawa and Kizu-gawa, and connecting to the main line at Imamiya station.

Plans were under way in 1939 for an additional railroad line with 4 tracks and a paralleling canal for lighters along the coast from Ōsaka to Kōbe to supplement existing rail and highway connections.

(*e*) *Supplies.*

1. WATER. Facilities for the supply of fresh water are good. The system is municipally operated. The wharves are amply supplied with hydrants, and ships at moorings are supplied by water barges. In 1936 the wharves of the inner harbor had 24 hydrants of 21,000 gallons per hour capacity each, 28 of 19,500 gallons per hour capacity each, and 36 of capacities from 7,900 to 13,200 gallons per hour each. The water boats available at that time consisted of: 1 motor boat of 52 gross tons with pump, capacity about 31,000 gallons per hour; 1 steam vessel of 56 gross tons, pumping capacity 26,000 gallons per hour; 1 steam vessel of 32 gross tons, pumping capacity 21,000 gallons per hour; 1 nonpropelled steel barge of 15,800 gallons capacity, with a pump of 15,800 gallons per hour capacity; 6 nonpropelled steel barges, 4 of 26,000 gallons capacity and 2 of 21,000 gallons capacity.

2. OIL AND GASOLINE. Vessels could be supplied with bunker oil from storage tanks operated by Mitsui interests and other firms on the east side of Umemachi Basin (Reference ③). Pipelines are believed to have been laid to Sakurajima No. 2 Pier (Reference ④). Pipelines of 12-inch diameter, 4 or 5 in number, are reported to extend from tanker berths in this locality to the installation of the Socony-Vacuum Oil Company, on the north bank of the Aji-kawa about 3,000 yards northeast of its entrance.

The Mitsui interests and the Socony-Vacuum Oil Company were at one time the only firms supplying bunker oil for vessel use. However, in 1934 it was reported that a large company, possibly a third firm, was planning extensive fuel oil storage for supplying vessels at the port. Another source reports that a 34,500-barrel and two 10,350-barrel oil tanks were built at Sakurashima in 1936, and also that two 2,700-barrel and six 350-barrel tanks were being built in 1937 at Sakurajima by the Hayama Oil Company. The Ogura Oil Company was reported installing three 5,500-barrel and six 1,400-barrel tanks at Ōsaka, but the exact location was not stated.

Several of the firms at Ōsaka are reported to have tank vessels, with a carrying capacity of about 1,400 barrels, able to supply fuel at the rate of about 1,000 barrels per hour.

A very large gasoline storage installation is reported without confirmation to have been built at the site of a gas works located at the intersection of the Shirinashi-kawa and Kizu-gawa. Based

*Town plan of Ōsaka, Chapter VIII.

on the unconfirmed reports, it has been estimated that this installation had in 1941 about 25 to 30 tanks of about 5,000,000 cubic feet capacity each, a figure probably inclusive of illuminating gas pressure tanks. Gasoline is reported transported by railroad tank car to the air base between the Kizu-gawa and the Kizu-gawa Canal, and to shipyards on the south bank of the Kizu-gawa.

A tabulation of commercial oil storage facilities as of December 1935, is shown in TABLE VI - 34, including tankage at refineries and installations not ordinarily used for bunkering vessels.

3. COAL. The more important of the 2 coaling depots in the port is the Mitsui installation at Sakurajima. It is reported that 7 vessels of 5,000 gross tons could be accommodated at the coaling wharves, indicating that all 3 wharves at Sakurajima (References ④ to ⑥), with a total berthing space of 2,838 feet, were used for this purpose. The stocks of stored coal were reputedly among the largest in the western section of Japan. Prior to the 1934 typhoon, the wharves were equipped with 9 traveling gantry bridge cranes for handling coal. The typhoon is reported to have left only 1 crane intact, and to have reduced the coal-handling capacity of the port 75 per cent.

Details of the reconstructed facilities are not known, but it is believed that operations have been fully restored. From 180 to 460 short tons of coal per hour could be handled mechanically into or out of a vessel berthed at the coal wharves.

A second coaling depot, operated by the Kaishima Shogyo Company, is on the south side of the Shirinashi-kawa, at its mouth (FIGURE VI - 110, Reference ㉑). A large stock was usually maintained. Handling equipment consisted of 1 or 2 traveling gantry bridge cranes.

Vessels could be bunkered at moorings in the stream, by use of coal barges, at the rate of about 60 tons per hour.

(f) Repair facilities.

1. DRYDOCKS. Known details of drydocks at Ōsaka are listed in TABLE VI - 35. In addition to those listed in the table the Urabe Company is reported to have a 200-foot drydock.

TABLE VI - 34

COMMERCIAL OIL STORAGE FACILITIES AT ŌSAKA, DECEMBER 1935.

LOCATION	OWNERS	NO. OF TANKS	STORAGE CAPACITY (BARRELS) TOTAL	GASOLINE, KEROSENE	DIESEL AND FUEL OIL	CRUDE OIL
Unknown	Asahi Oil Co.	7	74,700	—	74,700	—
N bank of Kizu-gawa Canal, 250 yds. and 600 yds. E of W end (2 plants)	Mitsubishi interests	8	100,500	1,300	99,200	—
E side of Umemachi Basin (Reference ③)	Mitsui interests	10	251,500	—	251,500	—
N bank of Aji-kawa, 3,000 yds. above entrance	Socony-Vacuum Oil Co.	2	40,800	6,500	34,300	—
Unknown	Shima	2	12,800	—	—	12,800
W bank of Chitose Canal, 900 yds. SE of N entrance	Maruzen Sekiyu Kabushiki Kaisha (Refinery)	9	17,900	3,800	—	14,100
S bank of Kizu-gawa Canal 1,500 yds. E of W end	Yoshida Sekiyuten Refinery	10	39,000	—	39,000	—
W bank of Chitose Canal 600 yds. SE of N entrance	Toyo Sekiyu Kabushiki Kaisha (Refinery)	3	32,000	—	—	32,000
Believed to be on N bank of Kizu-gawa, adjoining Socony-Vacuum Oil Co.	Japan Oil Co.	3	12,800	—	12,800	—
W bank of Kizu-gawa, to N of E end of Kizu-gawa canal	Rising Sun Petroleum Co.	12	83,900	62,100	21,800	—
		66	665,900	73,700	533,300	58,900

TABLE VI - 35

DRYDOCKS AT ŌSAKA

NAME	DRYDOCK NO. 1	DRYDOCK NO. 2	DRYDOCK NO. 1
Owned and operated by	Osaka Iron Works, Ltd.	Osaka Iron Works, Ltd.	Fujinagata Shipbuilding, Ltd.
Location on waterfront	Sakurajima Works, N bank of Aji-kawa.	Chikko Works, to S of W entrance to Kizu-gawa Canal.	On the Kizu-gawa, below E end of Kizu-gawa Canal.
Drydock:			
Type	Graving	Graving	Graving
Entrance:			
Width at coping	74′ 2″	57′ 0″	63′ 0″
Width on bottom	71′ 0″	—	60′ 0″
Body of dock:			
Extreme length	700′ 2″	437′ 6″	483′ 0″
Length on bottom	684′ 0″	430′ 0″	450′ 0″
Height of sill above bottom	4′ 0″	2′ 0″	4′ 0″
Depth on sill, H.W. O.S.T.	21′ 0″	23′ 6″	17′ 8″
Mean rise and fall of tide	3′ 6″	3′ 6″	—
Date built	Opened January 1915; extended 1929.	1921	—
Remarks	Wood dock; may have been enlarged.	Concrete and stone dock	Concrete and wood dock

NAME	DRYDOCK NO. 2	DRYDOCK NO. 3	NO DATA
Owned and operated by	Fujinagata Shipbuilding, Ltd.	Fujinagata Shipbuilding, Ltd.	Shirao-Shokichi
Location on waterfront	On the Kizu-gawa, at point believed below E end of Kizu-gawa Canal	On the Kizu-gawa, below E end of Kizu-gawa Canal	No data
Drydock:			
Type	Graving	Graving	Graving
Entrance width	41′ 0″	38′ 0″	37′
Body of dock:			
Extreme length	281′ 0″	246′ 0″	No data
Length on bottom	273′ 0″	239′ 10″	190′
Height of sill above bottom	3′ 0″	3′ 0″	No data
Depth on sill, H.W.O.S.T.	12′ 6″	11′ 6″	15′
Mean rise and fall of tide	3′ 6″	3′ 6″	3′ 6″
Date built	No data	No data	No data
Remarks	Concrete and stone dock	Concrete and stone dock	—

NAME	DRYDOCK NO. 1	DRYDOCK NO. 2	DRYDOCK NO. 1
Owned and operated by	Harada Zosen Kabushiki Kaisha	Harada Zosen Kabushiki Kaisha	Ono Tekko Zosensho
Location on waterfront	On the Kizu-gawa	On the Kizu-gawa	On the Kizu-gawa, 2,700 yds. N of E end of Kizu-gawa Canal.
Drydock:			
Type	Graving	Graving	Graving
Entrance width	36′ 0″	28′ 10″	28′ 10″
Body of dock:			
Extreme length	240′ 0″	155′ 0″	185′ 0″
Length on bottom	225′ 0″	151′ 11″	—

TABLE VI - 35 *Continued*

DRYDOCKS AT ŌSAKA

Height of sill above bottom	3′ 0″	3′ 0″		3′ 6″
Depth on sill, H.W. O.S.T.	13′ 9″	9′ 10″		10′ 10″
Mean rise and fall of tide	No data	No data		No data
Date built and/or rebuilt	No data	No data		No data
Remarks	Wood dock	Wood dock		Wood dock
NAME	DRYDOCK NO. 3	SANOYANSU DOCK	NO DATA	NANIWA WORKS DOCK
Owned and operated by	Ono Tekko Zosensho	Sanoyansu Dock Co.	Sanoyansu Dock Co.	Naniwa Dockyard Co., Ltd.
Location on waterfront	On the Kizu-gawa, 2,700 yds. N of E end of Kizu-gawa Canal	On the Kizu-gawa	No data	On the Kizu-gawa
Drydock:				
Type	Graving	Graving	Graving	Graving
Entrance width	40′ 0″	47′ 11″	48′	46′ 0″
Body of dock:				
Extreme length	280′ 0″	330′ 0″	No data	345′ 0″
Length on bottom	280′ 0″	305′ 0″	158′	330′ 0″
Height of sill above bottom	3′ 6″	No data	No data	No data
Depth on sill, H.W. O.S.T.	13′ 0″	14′ 9″	17′	14′ 0″
Mean rise and fall of tide	3′ 6″	3′ 6″	3′ 6″	3′ 6″
Date built and/or rebuilt	No data	No data	No data	No data
Remarks	Wood dock	Wood dock	—	Stone dock

NAME	NAMURA DOCK	DRYDOCK NO. 1	DRYDOCK NO. 2
Owned and operated by	Namura Zosensho Kabushiki Kaisha	Kizu-gawa Dockyard Co.	Kizu-gawa Dockyard Co.
Location on waterfront	Unknown	On the Kizu-gawa	On the Kizu-gawa
Drydock:			
Type	Graving	Graving	Graving
Entrance width	48′ 11″	40′ 0″	30′ 0″
Body of dock:			
Extreme length	345′ 2″	270′ 0″	170′ 0″
Length on bottom	330′ 0″	263′ 1″	166′ 0″
Height of sill above bottom	—	3′ 0″	3′ 0″
Depth on sill, H.W.O.S.T	14′ 5″	14′ 6″	12′ 6″
Mean rise and fall of tide	—	—	—
Date built and/or rebuilt	—	—	—
Remarks	Wood dock	Wood and stone dock	Concrete dock

NAME	OHARA DOCK	AMAGASAKI DOCK	NITTA DOCK
Owned and operated by	Ohara Dockyard Co.	Amagasaki Shipbuilding Co.	Nitta Senkyo Zosensho
Location on waterfront	On the Kizu-gawa	Shin Sumiyacho, believed on the Kizu-gawa.	Unknown
Drydock:			
Type	Graving	Graving	Graving

TABLE VI - 35 *Continued*

DRYDOCKS AT ŌSAKA

Entrance width	42′ 0″	37′ 0″	No data
Body of dock:			
Extreme length	266′ 0″	254′ 11″	478′ 0″
Length on bottom	265′ 0″	—	No data
Height of sill above bottom	3′ 0″	2′ 0″	No data
Depth on sill, H.W. O.S.T.	15′ 9″	18′ 10″	No data
Remarks	Wood and concrete dock	Wood dock	—

2. MARINE REPAIR PLANTS. The Ōsaka Iron Works is the principal dockyard and shipbuilding enterprise in Ōsaka. The main plant is at Sakurajima, on the north bank of the Aji-kawa near its mouth. A subsidiary dockyard is at Chikko, at the western end of the Kizu-gawa Canal. The company builds boilers, steam reciprocating and turbine engines, internal combustion motors, and produces structural iron.

The other dockyards of the port are practically all situated on the Kizu-gawa, mainly in its lower part. The largest of these is Fujinagata Shipbuilding, Ltd., which has its main plant on the south bank of the Kizu-gawa about 2,000 yds. above its mouth. There is a repair plant on the opposite bank of the river, and an annex to the establishment farther upstream. The firm has an electric furnace for steel castings up to 3 tons. The largest steel hammer is 2 tons. At the Aizawa Shipbuilding Yard, exact location not known, repairs to ships are reported possible. Engines, machinery, and structural iron are manufactured.

The Sumitomo Metal Industries, Ltd., steel works on the north bank of the Aji-kawa, near its mouth, manufactures ship parts and equipment such as rudder frames, ship stems, and anchors. The plant can make steel castings up to 40 tons and all kinds of forgings, such as propeller shafts, steering gear parts, etc. The equipment includes 6 hydraulic presses, the larger 3 being 3,000, 2,000 and 1,200 tons; and about 400 machine tools, the largest being a shaft-boring machine with a 144-foot bed. At its Nakayama works, on the south bank of the Kizu-gawa Canal, plates and sections for shipbuilding are produced.

Divers and some salvage equipment were maintained by the Imperial Salvage Company, Ltd., which is the largest salvage company in the Far East and has headquarters at Ōsaka. The firm's salvage tugs were based at Moji, Hakodate, and Otaru.

(9) Yokkaichi (34° 58′ N, 136° 38′ E).

Yokkaichi is in a small bight in the northwestern part of Ise-wan, on the southern coast of Honshū. The town is situated between the mouths of the Kabake-kawa and Mitaki-kawa. Development work has been in progress. A pier with 18 to 27 feet of water along its sides and a quay with less than 18 feet of water alongside are the main facilities.

(*a*) *Harbor.* An artificial harbor is protected on the south by a stone breakwater, 1,037 yards long, which extends eastward from Torisuno-hana (FIGURE VI - 117). Plans were made in 1938 to build a long breakwater extending about 960 yards east-southeastward from the mouth of the Mitaki-kawa on the right bank, and then about 1,685 yards south-southeastward, providing an entrance width of about 325 yards between its end and the southern breakwater. It is not known whether construction has been started on this breakwater.

A large area, approximately 1,000 yards square, westward and northwestward of the southern breakwater has been dredged to general depths of 30 feet.

On the north side of the harbor, a breakwater about 600 feet long extending southeastward and curving to the southwestward, and a pier extending from the western shore, form a shallow boat basin (FIGURE VI - 118). The entrance to the basin, between the heads of the breakwater and the pier, is about 135 yards wide, with maximum charted depths of 10½ feet. The boat basin, about 140 yards by 120 yards, covers an area of about 3½ acres, and has charted depths of 1½ to 12 feet. A canal, leading from the northwestern side of the boat basin, is about 290 yards long and 40 feet wide to the bridge spanning it, and has charted depths of 1½ feet. This canal ties into the canal network of the harbor.

Extensive land reclamation has been finished within the harbor. A large detached area, about 1,365 yards long and 520 yards wide, covering an area of about 110 acres and fronting the southeastern part of the town, has been reclaimed and is the site of the principal terminal in the harbor (FIGURE VI - 119). Three bridges connect this reclaimed area with the town. The neck of land forming Torisuno-hana, in the southeastern part of the harbor, and the land immediately westward also has been reclaimed.

1. ENTRANCE CHANNEL. The 716-yard entrance channel to the harbor, northward of the southern breakwater, has been dredged to a depth of 30 feet.

2. ANCHORAGE. Anchorage, dredged to a depth of 29 feet, to the northwestward of the southern breakwater, is reached through the entrance channel to the harbor. There were several mooring buoys. Temporary anchorage can be had about 1 mile off the lighthouse, on the end of the breakwater, in about 6 fathoms, soft mud bottom. Small craft can anchor nearer the lighthouse according to draft. This anchorage is exposed to southeasterly and southerly winds, which bring in a heavy sea. There is ample room off Yokkaichi in the northwestern head of Ise-wan, in depths of 5 to 13 fathoms, mud bottom, to accommodate an entire fleet.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water lunitidal interval at Yokkaichi is 6 hours 11 minutes. The highwater of springs rises 7½ feet above lowest low water, neaps 5¼ feet, and the mean tide level 4¼ feet. The flood tide sets northwestward and northward with a velocity of ½ knot; the ebb setting southeastward at the same rate.

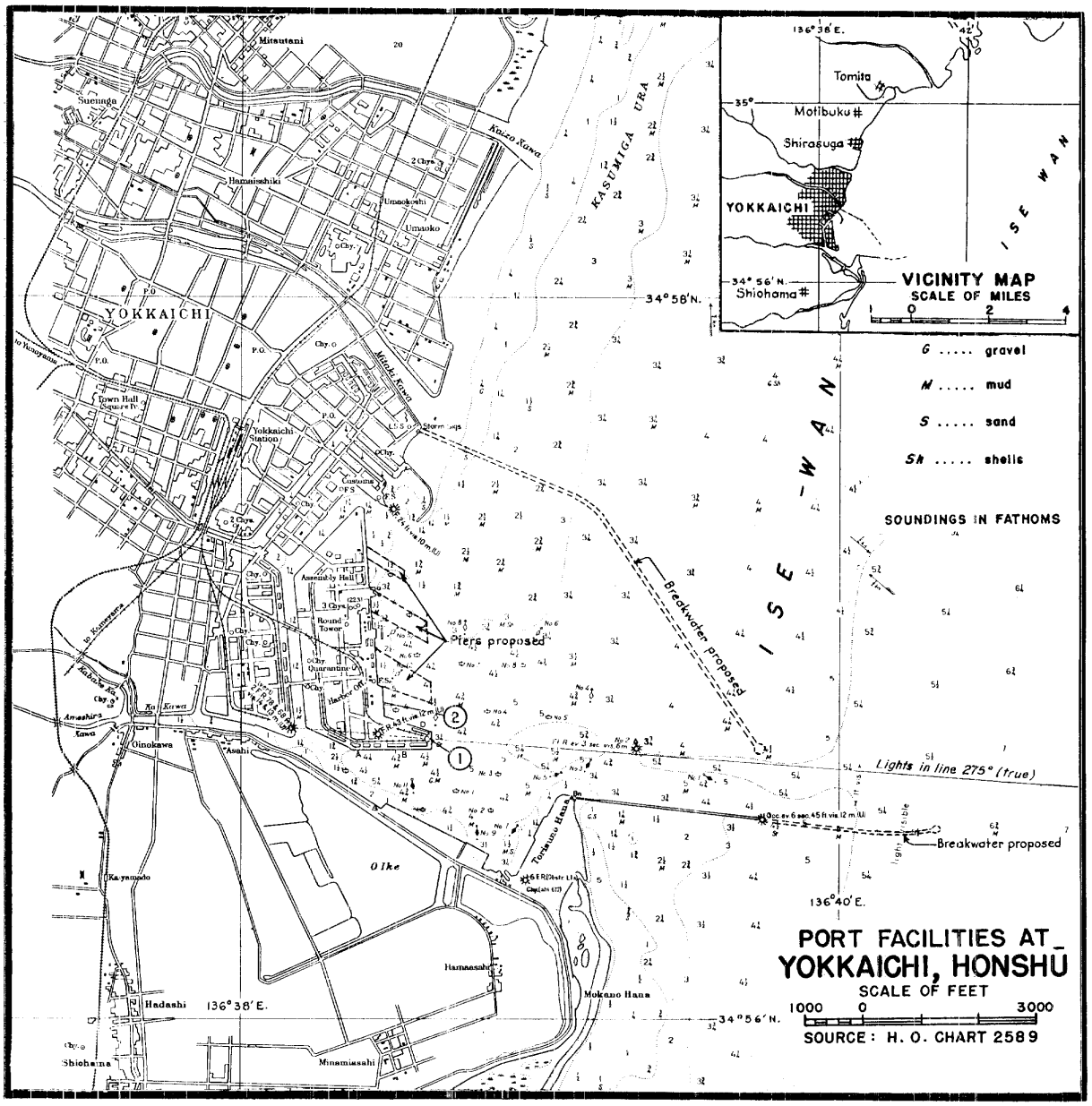

FIGURE VI - 117. *Yokkaichi.*
Map of harbor showing location of port facilities by encircled reference numbers.

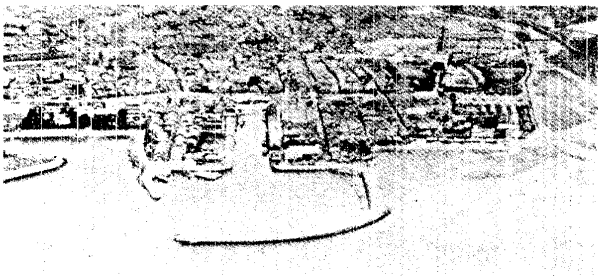

FIGURE VI - 118. *Yokkaichi.*
Boat basin, looking northwestward.

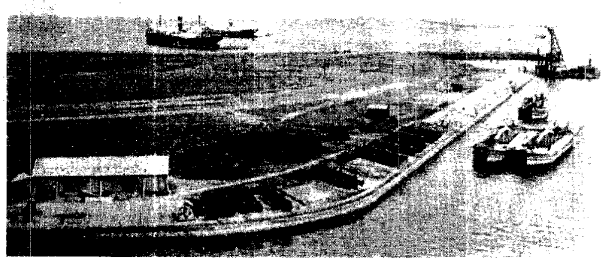

FIGURE VI - 119. *Yokkaichi.*
Land reclamation in SE part of harbor. 1931.

4. LOCAL WEATHER. At Yokkaichi the prevailing winds are from between west and northwest in winter and from between east and south in summer. During the typhoon season there may be particularly strong southeasterly winds and caution is necessary to prevent dragging. Heavy seas are not usually raised by the northwesterly offshore winds in winter.

(*b*) *Landing facilities.* The only terminal of importance is in the southern part of the harbor on the lower end of the island of reclaimed land at the mouth of Kabake-gawa. It consists of a pier and bulkhead wharf adjoining to the north. The construction of 3 other piers on the eastern side of the reclaimed island has been proposed, but as far as is known, the work has not been started. Details of the 2 main facilities are shown in TABLE VI - 36.

The reclaimed western side of Torisuno-hana appears to be faced or quayed, having stepped lengths and depths alongside, progressing southward, of about 325 feet 1½ feet deep, 350 feet 1½ to 7½ feet deep, and 650 feet 1½ feet deep.

The southern side of the harbor (right bank of the Kabake-kawa) also appears to be faced or quayed having stepped lengths and depths alongside, progressing westward, of about 425 feet 21 feet deep, 1,475 feet 6 to 9 feet deep, 150 feet 6 feet deep, and a curved length of about 4,100 feet 4½ to 12 feet deep. The left bank of the Kabake-kawa likewise appears to be faced or quayed with broken lengths and varying depths, of about 865 feet 10½ feet deep, 600 feet 6 to 7½ feet deep, 850 feet 4½ to 6 feet deep, and 525 feet 9 feet deep, progressing westward.

The pier forming the southwestern side of the boat basin is 420 feet long and has charted depths of less than 3 feet on the outer side and less than 6 feet on the inner side.

There is a total length of approximately 2⅓ miles of canals immediately behind the waterfront and roughly paralleling it, with charted depths of 1½ to 10½ feet. The northern entrance to these canals, south of the boat basin, has charted depths of 3 feet; the southern entrance, from the Kabake-kawa, has charted depths of 7½ feet. No details of clearances, span lengths, or construction of the 14 bridges shown spanning these canals are known. The canals are probably used by small craft.

The waterfront at the town of Shirasuga, in the northern part of the harbor, appears to be faced or quayed over a length of about 1,100 feet, but it dries alongside during low water.

Two breakwaters protect the entrance to the small harbor at Tomita, within the extreme northern part of Yokkaichi harbor. It consists of a long, narrow basin, about 1,100 feet long, and 130 and 80 feet wide. The depths are believed to be less than 3 feet.

There are tugs, lighters, and water boats at Yokkaichi.

(*c*) *Storage facilities.* Warehouses are located on both the north and south sides of the pier (Reference ①) at the southern end of the harbor, and also along the waterfront on the left bank of the Kabake-kawa, opposite the small town of Asahi. A double track railway serves the rear of these warehouses (FIGURE VI - 120).

(*d*) *Capacity and clearance.* The estimated unloading capacity of the port is 3,500 short tons per day.

Yokkaichi is connected by rail with Nagoya and Kameyama; an electric railroad connects it with Kuwana, Yunoyama, and Tsu. The main motor roads radiating from Yokkaichi afford

FIGURE VI - 120. *Yokkaichi.*
Warehouses along left bank of Kabake-kawa, looking eastward.

TABLE VI - 36

PIERS, WHARVES, AND QUAYS AT YOKKAICHI

Reference on FIGURE VI - 117	①			②
NAME	PIER			QUAY
Location on waterfront	S part of harbor			S part of harbor
Purpose for which used	Handling general cargo			Handling general cargo
Description:	Face (ft.)	S side (ft.)	N side (ft.)	Face (ft.)
Dimensions	300	1,350	825	500
Depth of water	19½	25½ to 27	18 to 24	Less than 18
Berthing space available	300	1,350	825	500
Transit sheds	Warehouses on S and N sides of pier			No data
Railway connections	Double tracks serve the rear of warehouses on both S and N sides of pier			Double track 250′ to rear of quay
Water supply	Available by water boats			Available by water boats
Estimated terminal capacity	3,000			500
Remarks	Berthage: three 450-ft. vessels drawing 20′, one 350-ft. drawing 20′, and two 250-ft. drawing 16′.			Berthage: two 200-ft. vessels drawing 12′.

connections with Kyōto, Ōsaka, and Kōbe; a bridge over the Kiso-gawa may provide highway connection with Nagoya and Tōkyō. There was daily communication by steamer with Matsuzaka, Tsu, and Atsuta in Ise-wan, and with Yokohama. Ocean-going steamers often called for cargo.

(*e*) *Supplies.* Water was available by water boats. Coal could be obtained at Yokkaichi; a stock of 10,000 to 15,000 tons was maintained.

(*f*) *Repair facilities.* A drydock and shipbuilding ways were reported under construction in July 1940, and were scheduled for completion in 1942.

(10) Nagoya (35° 04′ N, 136° 53′ E).

Nagoya, in the extreme northern part of Ise-wan, on the southern coast of Honshū, is the third largest city in Japan; it ranks third in manufacturing and is an aircraft production center. The city is about 5 miles northward of the harbor; the town of Atsuta is on a creek, 2.2 miles north of the harbor. Canals and railroad lines connect the city and harbor. Mooring buoys provided anchorage in 24 to 33 feet in the inner harbor; the entire Japanese fleet has anchored in Ise-wan off Nagoyo during maneuvers. The harbor has 5 main piers and quays, but other parts of the waterfront have been extensively quayed.

(*a*) *Harbor.* The port of Nagoya, at Tsukiji about 5 miles southward from the city, is an artificial harbor consisting of an outer harbor, a long entrance channel, and an inner harbor (FIGURE VI - 121). The harbor limit is within a radius 2.9 miles from the head of the west breakwater. The outer harbor, within

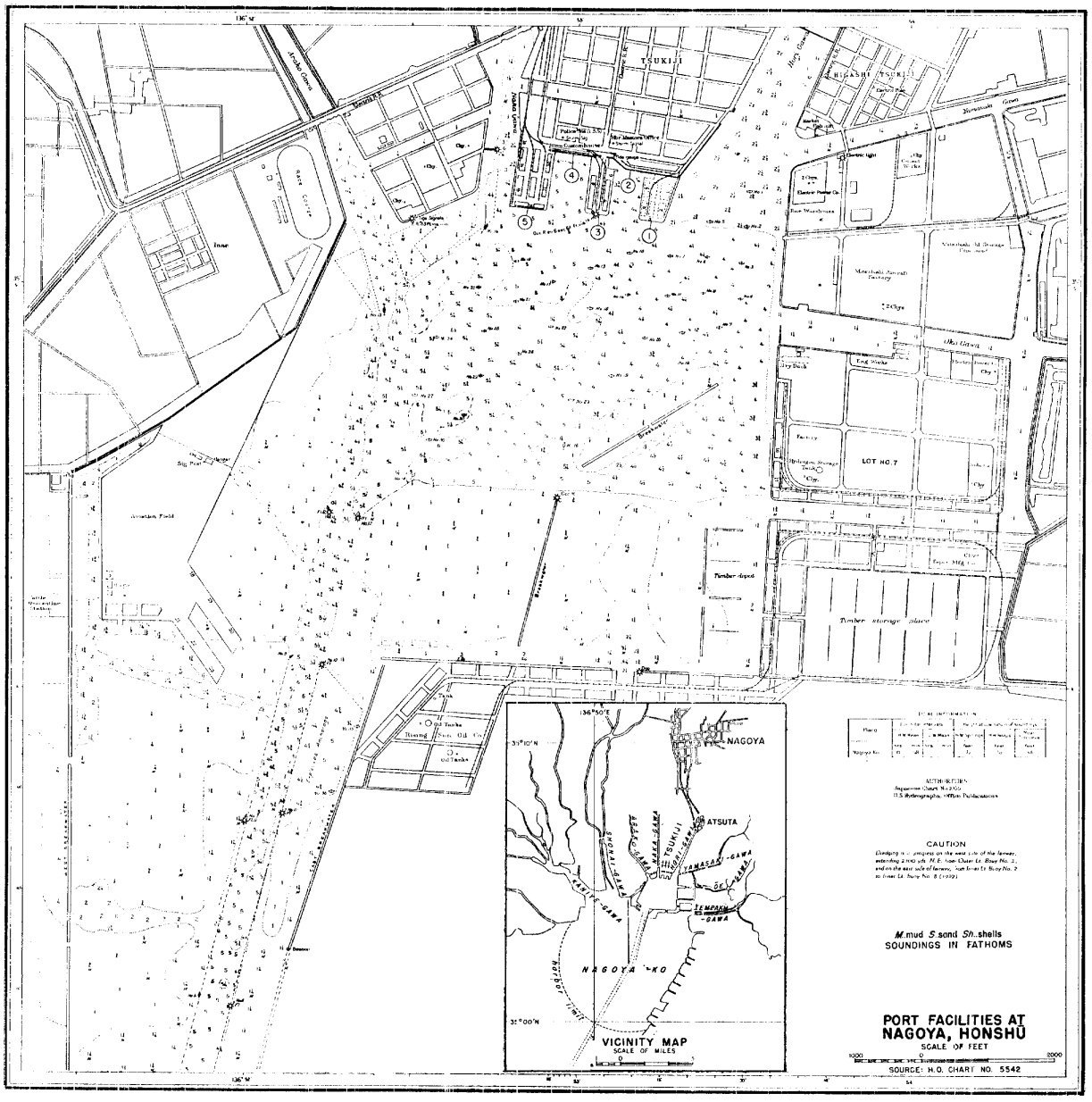

FIGURE VI - 121. *Nagoya.*
Map of harbor showing location of port facilities by encircled reference numbers.

the area between the outer side of the breakwaters and the harbor limit, has depths ranging from 1 to 6 fathoms.

1. BREAKWATERS. The inner harbor is protected on the south and southwest by breakwaters. The western breakwater extends 2.3 miles southward from Eitoku; it has 3 openings for the passage of small craft; 2 are about 35 yards wide, and the southernmost one is about 25 yards wide. This breakwater diverts the mouth of the Shonai-gawa from the entrance channel.

The eastern breakwater extends 1.5 miles westward from the shore near Nawamura, with an opening for small vessels about 85 yards wide 1 mile from the shore. An extension, with an opening about 30 yards wide at the northern end, projects 1,500 yards to the south-southwestward. The height of the breakwater is 17.5 feet above low water level. This breakwater diverts the mouth of the Tempaku-gawa (Amashiro-gawa) from the inner harbor and the entrance channel, and affords protection against the strong southeast winds.

A groin, 2,285 yards long, which is always submerged, extends from the head of the east breakwater to a point about 500 yards eastward of the west breakwater light. Its southern extremity and middle part were marked by conical buoys.

There are 2 detached breakwaters within the inner harbor. One extends 775 yards northward in the south central part, and has an opening about 85 yards wide between its southern end and the east breakwater. The other breakwater is in the east central part, and lies in a northeast – southwest direction; it is about 800 yards long, with an opening about 20 yards wide in its middle, and about 200 yards wide between its southwestern end and the northern end of the breakwater to the south.

2. INNER HARBOR. The inner harbor covers an area of 2,115 acres. The northern two-thirds, embracing an area approximately 2,100 yards by 1,400 yards, has general depths of 24 to 33 feet, except for a shoal, 150 yards to 350 yards wide surrounding the east central breakwater. The shoal has depths of 3 to 15 feet.

3. RIVERS AND CANALS. Several streams discharge into the inner harbor, among which are the Arako-gawa, Naka-gawa, and Hori-gawa from the northward, and the Yamasaki-gawa and Ōe-gawa from the eastward. These rivers have been dredged for various distances. Together they form a total of 20.8 miles of navigable waterways.

The Naka-gawa has been canalized to Nagoya for a length of 4 miles. It has a width at the water surface of 208 to 298 feet, with a depth of 10 feet during ordinary water and 7 feet during low water. The vertical walls of the canal, which are founded on piles, are 12 feet above the bottom of the canal; sloping banks rise 5 feet above the tops of the walls. This makes the total depth of the canal equal to 17 feet. On either side of the canal the land has been reclaimed for a width of about 435 feet, to be used for wharves and industrial plants. It has 1 lock at its lower end, 358 feet long and 35 feet wide. A short canal also was built connecting the Naka-gawa and Hori-gawa Canals.

The Hori-gawa has also been canalized to Nagoya for a length of about 6.8 miles. It passes through the town of Atsuta. The Shinhori-kawa Canal branches off the Hori-gawa Canal 5,000 feet above its mouth, and runs parallel to it for about 2.8 miles to the central part of Nagoya.

No details regarding the clearances, span lengths, or construction of the several bridges crossing the 2 canals are available. However, it is reported that the Naka-gawa Canal can be used only by small steamboats and junks.

4. ENTRANCE CHANNEL. The entrance channel leads through the outer harbor to the heads of the breakwater in a north-northeasterly direction. It is about 4 miles long to the breakwaters and has a width of about 225 yards, with a controlling depth of 27 feet. At the heads of the breakwaters, it turns slightly northward, and then continues 4,800 yards to the inner harbor, with a width of 180 yards and depths of 27 to 36 feet.

Three small channels branch off to the westward from the entrance channel at the inner harbor. The southernmost is about 60 yards wide, with depths of 13½ feet; it has a wye to the southwestern side of the southwestern pier at the airport and is 25 yards wide and 9 feet deep. The 2 branches converge again at the southwestern corner of the airport and continue along the western side of the airport where it is 50 yards wide and 10½ feet deep. The middle channel is 35 yards wide and 9 feet deep, and leads to the eastern corner of the northeastern pier at the airport. The northern channel is also 35 yards wide and 7½ feet deep, and leads to the airport; the head of this channel has a small turning basin about 115 yards in diameter.

5. ANCHORAGE. There were about 32 mooring buoys, located in 3 lines, within the inner harbor, in depths of 24 to 33 feet, mud bottom. Anchorage is available for oil tankers, adjoining the entrance channel to the eastward near its head, in depths of 19½ to 30 feet, in an area 625 yards long and 250 yards wide.

The outer harbor, within the harbor limit, affords approximately 260 third-class anchorage berths, equally divided by the entrance channel. The western side has a mud bottom, and the eastern side a combination of mud, sand, shell, and gravel bottom. Ise-wan, southward of Nagoya, has sheltered the entire Japanese fleet during maneuvers.

6. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water lunitidal interval is 6 hours 08 minutes; the high water of springs rises 7½ feet above lowest low water; neaps rise 5½ feet; and the mean tide level is 4.6 feet. The tidal current has a velocity of 1 to 1½ knots.

7. LOCAL WEATHER. The mean temperature at Nagoya is 58.1°, maximum 99.9°, minimum 13.5°; the average annual rainfall is 67.1 inches, and the mean relative humidity 75 per cent. There are 146 rainy days per year. The mean velocity of the wind is 4.9 knots, with the maximum 54.8 knots. There is a total of 4.1 days per year with fog.

It is reported that northerly winds, which often haul to the eastward, prevail in winter. The strongest winds are frequently from southeastward, and the heaviest seas may accompany those from westward.

(*b*) *Landing facilities.* The waterfront of the inner harbor has been developed by reclaimed land on all sides totalling 1,000 to 1,235 acres. This land has been divided into large tracts separated by canals, the sides of which are quayed with masonry walls. These canals, including the mouth of the Arako-gawa, but excluding the Naka-gawa and Hori-gawa, have a total length of about 4.3 miles; the widths range from 50 to 225 yards; the most are about 100 yards wide; the depths range from 1½ to 27 feet, with about 9 feet the most prevalent depth. There is a total length of approximately 9.8 miles of quay walls along these canals.

Industrial establishments, including the Mitsubishi Aircraft Plant, one of the largest in Japan, are on the eastern waterfront:

the 3 main piers in the harbor are on the northern side; the aviation field and 2 less important piers on the western side; and the Rising Sun Oil Co. installation on the southern side. Northward from the root of the east pier, (Reference ①), and fronting on the Hori-gawa, a stretch of waterfront, about 1,000 feet long, is believed to be quayed with depths alongside of about 12 feet. This frontage is served by railroad tracks, warehouses, and a flour mill at the rear (FIGURES VI - 122 through VI - 124).

Details of the principal piers and wharves are shown in TABLE VI - 37.

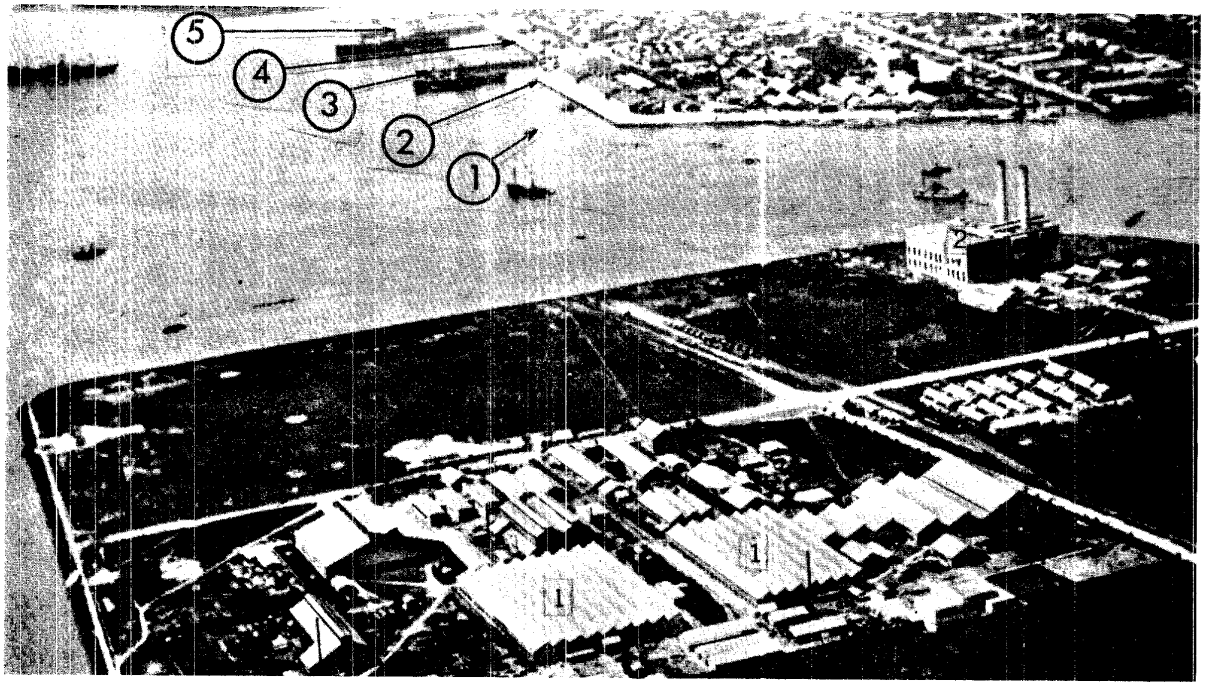

FIGURE VI - 122. *Nagoya.*
Waterfront at head of harbor, looking eastward. Encircled numbers are references to port facilities located on FIGURE VI - 121. Two piers (References ① and ⑤) under construction.

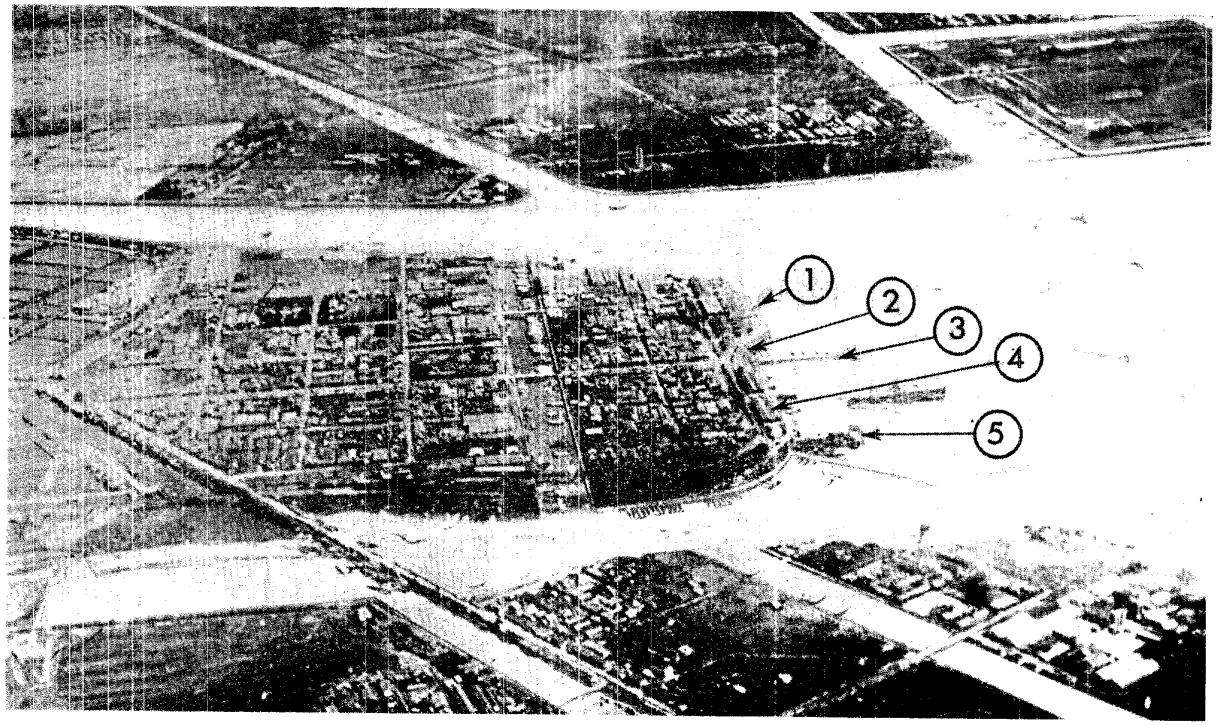

FIGURE VI - 123. *Nagoya.*
Head of harbor, looking west-northwestward. Encircled numbers are references to port facilities located on FIGURE VI - 121. Pier (Reference ①) not yet constructed. Mitsubishi aircraft plant in center foreground; steam power plant at right center. 1932.

TABLE VI - 37

PIERS, WHARVES, AND QUAYS AT NAGOYA

Reference on FIGURE VI - 121	①		
NAME	EAST PIER		
Location on waterfront	N side of inner harbor		
Purpose for which used	Handling general cargo		
Type of construction	No data		
Description:	Face (ft.)	E side (ft.)	W side (ft.)
Dimensions	420	750	645 + 150 + 75
Depth of water	24 to 25½	15	18 to 25½
Berthing space available	420	750	645
Width of apron	60	—	—
Transit sheds	Warehouses at root of pier; 6 warehouses proposed on pier.		
Railway connections	E side of pier served by railroad; rear of proposed warehouses on W side also served by railroad; front and rear of warehouses at root of pier served by railroad.		
Water supply	Available at pier or from water boat		
Estimated terminal capacity	2,000		
Remarks	Traveling cranes proposed for this pier; berthage: two 450-ft. vessels drawing 20′ and three 200-ft. vessels drawing 12′.		

Reference on FIGURE VI - 121	②	③		
NAME	QUAY	CENTRAL PIER		
Location on waterfront	N side of inner harbor	N side of inner harbor		
Purpose for which used	Handling general cargo	Handling general cargo		
Type of construction	No data	No data		
Description:	Face (ft.)	Face (ft.)	E side (ft.)	W side (ft.)
Dimensions	450 + 240 + 45	358	750 + 150 + 150	835
Depth of water	19½	24 to 30	22½ to 25½	24 to 30
Berthing space available	450 + 240	358	750	835
Width of apron	—	60	36	36
Transit sheds	Warehouses along quay front	1—525′ by 80′; 1—475′ by 80′; 1—750′ by 50′.		
Railway connections	Front and rear of warehouses served by railroad.	All warehouses served by railroad, none on quay side.		
Water supply	Available at quay or from water boat	Available at pier or from water boat		
Estimated terminal capacity	700	2,500		
Remarks	Berthage: one 250-ft. vessel drawing 16′, and two 200-ft. vessels drawing 12′.	Traveling cranes proposed for this pier; berthage: two 450-ft. vessels drawing 20′, two 350-ft. drawing 20′, and one 250-ft. drawing 16′.		

Reference on FIGURE VI - 121	④	⑤		
NAME	QUAY	WEST PIER		
Location on waterfront	N side of inner harbor	N side of inner harbor		
Purpose for which used	Handling general cargo	Handling general cargo, and passengers.		
Type of construction	No data	Faced with stone and concrete		
Description:	Face (ft.)	Face (ft.)	E side (ft.)	W side (ft.)

TABLE VI - 37 *Continued*

PIERS, WHARVES, AND QUAYS AT NAGOYA

Dimensions	550	540	900	1,150
Depth of water	24	30	24 to 30	12 to 27
Berthing space available	550	540	900	1,150
Width of apron	—	17	45	50
Transit sheds	Warehouses along quay front; custom house to rear.	4—350′ by 80′; 1—300′ by 65′; 1—250′ by 65′; 1—200′ by 65′; 1—175′ by 65′.		
Railway connections	Rear of warehouses served by railroad	W side of pier and all warehouses served by railroad		
Water supply	Available at quay or from water boat	Available at pier or from water boat		
Estimated terminal capacity	600	3,000		
Remarks	Berthage: one 450-ft. vessel drawing 20′.	Traveling cranes proposed for this pier; berthage: two 450-ft. vessels drawing 26′, two 450-ft. drawing 20′, and two 200-ft. drawing 12′ can be berthed.		

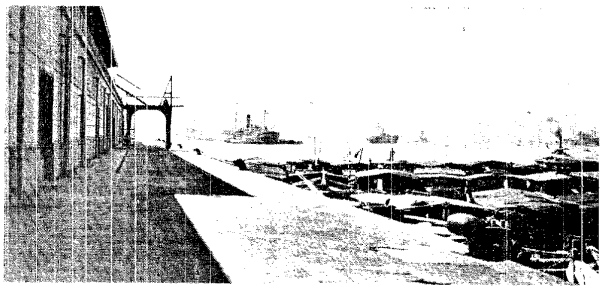

FIGURE VI - 124. *Nagoya.*
Pier at head of harbor, looking southward.

Tugs and lighters are available; in 1931 it was reported that there were more than 500 lighters in the port. Two floating cranes were available in 1934; they were steam-operated and had capacities of 30 and 12 tons.

(*c*) *Storage facilities.* A large flour mill is 200 yards northward of the root of the east pier. Two one-story steel warehouses having a total area of 56,934 square feet are on the west pier. Four additional warehouses of the same size, and 2 slightly smaller ones were scheduled to have been erected. The warehouses shown on the chart indicate a total area of about 172,125 square feet, but proposed construction indicates an area of 195,000 square feet. All the warehouses on this pier are served by railroad. The central pier has 3 warehouses having a total ground area of about 117,500 square feet, all of which are served by railroad. Six warehouses have been proposed for the east pier; they would have a total ground area of about 244,000 square feet; the buildings on the west side and middle of the pier were to have been served by railroad. Believed to be in addition to that above, it was reported that in 1934 there were 3 government warehouses in the port covering an area of 44,586 square feet; of this total 13,878 square feet was bonded; private warehouses provided a storage space of 320,310 square feet; of this total 51,849 square feet was bonded. The Rising Sun Oil Co. warehouses have a total floor area of 10,600 square feet. Whether this figure is included in the above totals is not known. Many warehouses front the various canals in the port.

(*d*) *Capacity and clearance.* The estimated unloading capacity of the port is 8,800 short tons per day.

The city of Nagoya has direct rail connection with the harbor by the Rinko Railway Line. Nagoya is an important intermediate station on the Tōkaidō Main Line. The harbor also is connected to the city by 3 canals, the Naka-gawa, Hori-gawa, and Shin-hori-gawa. Nagoya-kō is a port of call for many steamship lines. Trade was carried on directly from this port by 26 lines (FIGURE VIII - 107).*

The principal imports consisted of raw materials for the numerous industries of the region, such as wool, timber, coal, cotton, machinery, and wheat. Textiles and chinaware constituted 77% of the exports; the remainder consisted of machine shop products, lumber products, teas, and beer.

(*e*) *Supplies.* Good quality water is available at the piers or from water boats.

The Rising Sun Oil Co. has storage facilities for 73,600 barrels of white products (gasoline and kerosene), and 25,600 barrels of black products (fuel oil and Diesel oil). In 1938, the Mitsui Co. planned to build storage tanks for 1,087,500 barrels of fuel oil for the Rising Sun Oil Co. The Japan Oil Co. had under construction two 6,920-barrel tanks, two 3,145-barrel tanks, and two 1,887-barrel tanks at Nagoya; these tanks for heavy oil, gasoline, and light oil were scheduled for completion in June 1938.

Vessels at the Rising Sun Oil Co. lie stern-to at the wharf with anchors down and lines to shore. An 8-inch pipe line for handling Diesel oil is available. The average rate of discharge is about 1,450 barrels per hour and the maximum rate of bunkering is 300 barrels per hour. There were no tank lighters. Lighters for packed cargo could be hired; case oil must be discharged into lighters by ship's gear.

Normally about 5,000 tons of coal were available at Nagoya. It was loaded by lighters, using ship's gear, at a rate of about 10 tons per hour.

The hydroelectric power plants of the Toho Electric Power Co., which supplies Nagoya with electric power, have a capacity of 62,000 kw (FIGURE VI - 125). In addition to this, the company buys 110,000 kw. from 4 other power companies. The Toho Electric Power Co. also has a steam-electric plant with a capacity of 83,000 kw. In addition, the power company in 1939,

*Town plan of Nagoya, Chapter VIII.

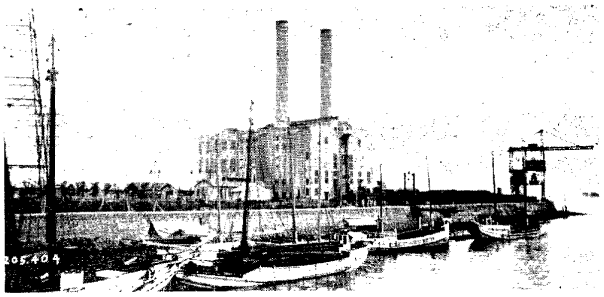

FIGURE VI - 125. *Nagoya.*
Toho Electric Power Co. plant in NE part inner harbor. 1928.

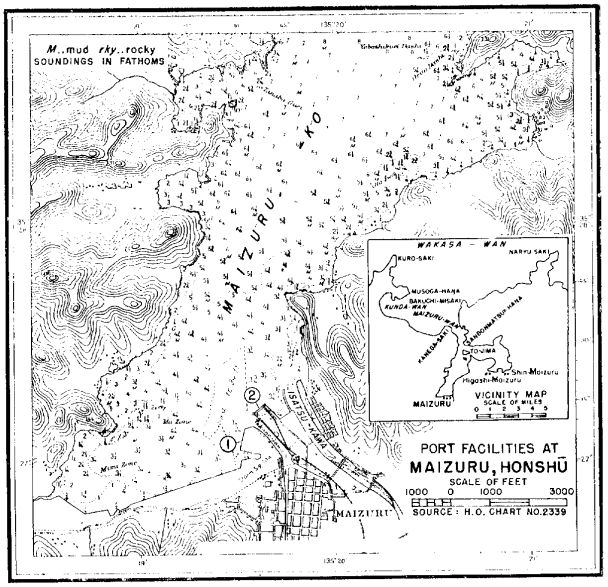

FIGURE VI - 126. *Maizuru.*
Map of harbor showing location of port facilities by encircled reference numbers.

was constructing hydroelectric power plants on the Hida-gawa and Tenryū-gawa having a capacity of 313,320 kw.

(*d*) *Repair facilities.* In 1934, there was a drydock, about 178 feet long and 46 feet wide with a depth on the sill during mean high water of about 10 feet, at the mouth of the Ōe-gawa on the left bank. Construction plans called for another drydock of 5,000 tons capacity. Reports indicate some shipbuilding activity and small shipyards are on the Hori-gawa Canal.

B. Secondary ports.

(1) *Maizuru* (35° 27′ N, 135° 20′ E).

Maizuru is on the western coast of Honshū, at the southern end of Maizuru-wan, a part of Wakaco-wan on the Japan Sea coast. Open to the northward, Maizuru-wan is a bay indenting the coast for about 2 miles, then dividing into 2 arms, one extending east-southeastward for about 3 miles, and the other extending south-southwestward for a similar distance. The naval base of Higashi-maizuru and Shin-maizuru are on opposite sides of the head of the eastern arm (Chapter XIII, Topic 133, B). The western arm, known as Maizuru-kō, is a commercial port. The town of Maizuru lies on the southeastern side at the head, mainly on the western side of the Takano-gawa. A large wharf capable of berthing a 10,000-ton ship has been reported, but details are not available. Depths alongside the known facilities range from 12 to 22 feet.

(*a*) *Harbor.* Maizuru-kō is a natural landlocked inlet, about 3 miles long and ¼ mile wide (FIGURE VI - 126). Depths range from 7 fathoms at the entrance to about 3½ fathoms at the head. The harbor is well sheltered and usually calm; its eastern, western, and southern sides are encircled by hills. Two rivers, the Takano-gawa and the Isatsu-gawa, flow into the harbor at the eastern side of the head. An area off the Takano-gawa, with a channel to the west quay 125 yards wide, has been dredged to a depth of 24 feet.

1. ENTRANCE CHANNEL. The entrance to Maizuru-wan is open to the northwestward between Kanega-saki and Bakuchi-misaki, a headland about 1¾ miles northeastward of the point. The entrance passage narrows to 700 yards at its southern end 1½ miles from Kanega-saki. From Sanbonmatsu-hana, on the eastern side, the eastern inlet extends 3 miles to its head. The southern inlet continues south-southwestward about 3½ miles. To-jima, lying at the juncture of the 2 inlets, narrows the passage to Maizuru-machi to about 600 yards. Southward the inlet is from 1½ to ⅜ mile wide. Numerous rocks and shoals lie off the points and the head of the inlet is constricted by shore shoals. Mimi-zone, a wide shoal with 1 to 3 fathoms, fills the southwestern corner of the head of the inlet. Ma-zone, a rocky shoal, extends into the inlet from the western side near the head.

Depths in the entrance passage of Maizuru-wan are 11 to 15 fathoms. Southward of To-jima depths are 8 to 9 fathoms decreasing gradually to the 5-fathom curve about ¾ mile from the head of the inlet.

2. ANCHORAGE. The Maizuru-wan, or Maizuru outer bay, including Kunda-wan, could provide space for 100 first-class anchorage berths. In Maizuru-kō space may be found for 12 first-, 5 second-, and 14 third-class anchorage berths, over mud.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water interval in Maizuru-wan is 2 hours 23 minutes. Mean high water springs rise 0.9 feet; neaps rise 0.8 feet. There is a remarkable rise and fall in Maizuru-ko with periods of 16 minutes, about 75 minutes, and about 90 minutes. During a gale the difference in level may amount to 3 feet.

4. LOCAL WEATHER. There is heavy rainfall in July and November; the rainy season in general extends from June to November. Fogs are frequent in summer. Prevailing winds are north and northwest from January to March. Northwest gales frequently occur during this period; they are severe, give little notice of their approach, last 1 to 3 days, and raise a high sea. Typhoons may be expected from July to October. Winters are severe with heavy snows.

(*b*) *Landing facilities.* The principal facilities are located on the projecting point of land formed between the Takano-gawa and the Isatsu-gawa. A rectangular shaped wharf, known as the railroad and coaling pier, extends along the northeast

bank of the Takano-gawa. Westward from the mouth of the Takano-gawa extensive reclamation and construction work has been done. A sea wall or quay extends nearly all the way across the head of the harbor. A large wharf, recently constructed on the western side of the mouth of the Takano-gawa, is reported capable of berthing a 10,000-ton ship, but definite construction data are not available. It is reported that ships moor stern-to at this wharf and load or discharge cargo into lighters, or use gangways.

The known details of the 2 principal wharves and piers are given in TABLE VI - 38.

Miscellaneous duty boats (tugs and salvage ships) based at Maizuru include the Oshima (ex Midori) for harbor and coastal use and 3 tank boats, one with pumping equipment.

(*c*) *Storage facilities.* There appears to be considerable open space on the railroad and coaling pier. The reclaimed area on the western quay is about ½ mile long and from 50 to 200 yards wide. The work was still in progress in 1937 and it is not known whether the fill has been completed. A railroad connection with the reclamation project has been indicated. A road or street of the town follows the original shoreline back of the filled area.

(*d*) *Capacity and clearance.* The estimated capacity of the port is 600 short tons per day. In 1934, 385 steam vessels with total tonnage of 270,180 entered the port at Maizuru.

It is believed that the rail and street facilities of the eastern pier are adequate to handle the cargo unloaded. The new western quay may have a rail connection. It is paralleled by the shore road and could probably be cleared of the tonnages unloaded at the 2 narrow spaces charted. However, if the whole length of the new hydraulic fill were available for quayage, rail connection would be imperative for clearance as the hills backing the reclaimed area would necessitate movement along the narrow coastal strip.

Maizuru is connected to the main Japanese railroad at Ayabe. Tracks extend to Miyazu, Shinmaizuru, and Tsuruga. A single track is indicated leading southward from the railroad coaling pier and between the 2 rivers. Narrow-gauge lines may be used for the spurs similar to those at the Maizuru Naval Station. City streets lead from all the docks and connect to the coastal and island roads. Coastwise vessel service is maintained with Wakasa-wan ports.

(*e*) *Supplies.* Water is laid onto the piers at Maizuru and there are 3 tank boats, including one with pumping equipment, which can supply at a maximum rate of about 8 tons per hour. All known supplies of petroleum products are at the Naval Station. The commercial harbor at Maizuru has a coaling pier at the outer end of the railroad spur along the east side of the Takano-kawa. The bunkering capacity and quantity of coal on hand are not known. The only known supplies of bunker coal

TABLE VI - 38

PIERS, WHARVES, AND QUAYS AT MAIZURU

Reference on FIGURE VI - 126	①	②		
NAME	WESTERN QUAY	RAILROAD PIER		
Location on waterfront	Westward of mouth of Takano-gawa.	E side of Takano-gawa		
Owned by	No data	No data		
Operated by	No data	No data		
Purpose for which used	General cargo, military.	General cargo and passengers, coaling pier.		
Type of construction	Believed masonry quay	Believed masonry quay, solid fill.		
Description:	Face (ft.)	Face (ft.)	SW side (ft.)	NE side (ft.)
Dimensions	550	420	1,200	520
Depth of water	12 to 14	11 to 21	6 to 21	22
Berthing space available	550	420	1,200	520
Width of apron	Open wharf	Open wharf		
Deck above low water	No data	No data		
Capacity per square foot (lbs.)	No data	Unlimited		
Lighted or unlighted	No data	No data		
Transit sheds	No data	No data		
Mechanical handling facilities	No data	Two cranes of 30 and 50 tons capacity		
Railway connections	No data	Tracks on NE and SW sides; about 1,700 linear ft.		
Water supply	No data	Water piped on pier		
Electric current	No data	No data		
Estimated terminal capacity	---	600		
Remarks	Vessels moor stern-to, breasting off with lighters or gangways.	Depths of 21′ have been dredged on both SW and NE sides for unknown distance. 1 vessel 450′ long drawing 20′ can be berthed.		

are at the Maizuru Naval Station in the eastern inlet. There is a large steam coal power plant at Miyazu and a high tension power transmission line, which follows the railroad between Maizuru and Miyazu. This probably connects with the commercial harbor system. The Naval Station has its own power plant.

(f) Repair facilities. There are no commercial drydocks at Maizuru. It was reported that building slips suitable for 1,000-ton ships were to be constructed at Maizuru by the Maizuru Shipbuilding and Engineering Company. If established this yard would probably provide some facilities for machinery repair. No repair facilities for hulls are reported.

(2) Matsue (35° 28′ N, 133° 03′ E).

Matsue, on the northwest coast of southwestern Honshū, is on both banks of Ohashi-gawa, a river connecting Shinji-ko and Nakami. A quay with 6 feet of water alongside and a drydock are the only facilities.

(a) Harbor. Matsue-kō, at the eastern end of Shinji-ko, consists of the western end of the river and the lake area off the town; the principal part is in the river. Shinji-ko, a lake about 9 miles long and 3 miles wide, is the source of Ohashi-kawa. Depths in Shinji-ko near Matsue are very shallow, ¼ to 1½ fathoms, but central depths are 2 to 3½ fathoms. The river channel has been dredged to 15 feet. Two bridges span the river at Matsue.

(b) Landing facilities. A quay, with a depth of 6 feet alongside, extends about 1,330 feet along the southern shore of the river, eastward and westward of the second bridge.

(c) Repair facilities. A drydock is reported at Matsue, but its location has not been determined. Details of the graving drydock are:

Entrance—	
Width at coping (feet)	26.0
Body of dock—	
Length, coping head to side of caisson (feet)	140.0
Length on bottom (feet)	135.0
Depth on keel blocks, M.H.W. (feet)	7.5

(3) Ezumi (Yezumi) (35° 31′ N, 132° 58′ E).

Ezumi is on Ezumi-ura (Etomo-kō) on the northwest coast of Honshū. The harbor fronts the town on the eastern shore of the bay at the mouth of the Sada-gawa. Wharf facilities with a maximum of 10½ feet alongside are available for small coastwise vessels and fishing craft.

(a) Harbor. Ezumi-kō is an artificial harbor formed and protected by outer and inner breakwaters (FIGURE VI - 127). the outer breakwaters are elbow-shaped; the northern arm extends about 600 feet in a southwesterly direction from a point at the northern side of the harbor, then angles in a southerly direction for about 450 feet. The southern arm extends for about 600 feet in a west-northwesterly direction from a point about 200 yards south of the river mouth, then trends northwestward for another 600 feet. The entrance between the extremities is about 100 yards wide.

Two detached offshore breakwaters, each about 300 feet long, lie about 250 feet off and westward from the heads of the piers. A short breakwater, about 160 feet long, extends southward from near the root of the northern outer breakwater. These inner breakwaters each have 130-foot openings between their extremities. The 20-acre harbor has depths over most of the area of not more than 10½ feet but depths at the entrance are about

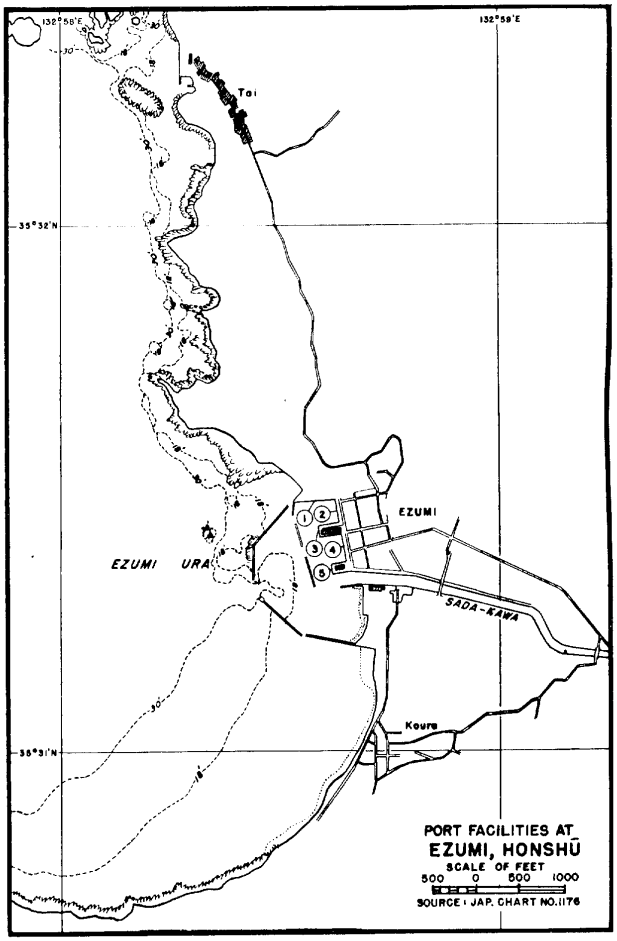

FIGURE VI - 127. *Ezumi.*
Map of harbor showing location of port facilities by encircled reference numbers.

30 feet. There are depths in the river mouth ranging from 5 to 7.5 feet. A bridge crosses the river about 1,150 feet from its mouth.

The entrance through Ezumi-ura, is clear and free of obstructions, except that it is reported that fishing nets are laid in the approach from April to November. The depths in the entrance to the bay are 15 to 16 fathoms, with general depths inside ranging from 3½ to 10 fathoms.

Except during offshore winds, temporary anchorage is found near the middle of the bay. The best location for small craft is in depths of about 6 fathoms, with the north breakwater light bearing 14°, distant about 600 yards. A few small craft can moor within the outer breakwaters, in 3½ to 4 fathoms, over good holding ground, mud bottom. Gales send a considerable sea over the outer breakwaters and, with the accompanying swell, cause rough riding. There are 2 first-class and 3 second-class anchorage berths in the bay.

Tides and tidal currents are of no consequence to navigation.

In the vicinity the winds are comparatively steady, sometimes blowing from one direction for 2 or 3 weeks at a time. Northwesterly winds are strongest and most frequent in winter, but cease in April. Light southerly winds prevail in summer, chang-

ing to easterly in late August, and to northerly with the coming of bad weather in October.

(*b*) *Landing facilities.* In the inner basin at Ezumi there are 2 piers and 3 quays with a total length of about 1,030 feet, and depths alongside of 6 to 10½ feet. The piers are about 230 and 170 feet long, respectively, and both are about 120 feet wide. The southern side of the shorter pier forms a training wall for the north side of the river mouth and is probably not often used as a berth. Known details of wharf facilities are described in TABLE VI - 39.

Southward from the mouth of the river there appears to be a seawall or quay with a length of about 300 feet. The chart shows a narrow beach at its base and the depths offshore are shallow. The banks of the river are believed to be quayed but are accessible to small boats only. The town of Koura is located on the shore of the bay about ¼ mile southward from the harbor. The landing is on a sandy beach.

TABLE VI - 39

PIERS, WHARVES, AND QUAYS AT EZUMI

Reference on FIGURE VI - 127	①	②	③		
NAME	NORTH QUAY	EAST QUAY, N SECTION	NORTH PIER		
Location on waterfront	N side of harbor	Southward from north quay	S end of Reference ② E side of harbor		
Owned and operated by	No data	No data	No data		
Purpose for which used	General cargo, small craft.	General cargo, small craft.	General cargo, coastal and small craft.		
Type of construction	Believed masonry	Believed masonry	No data		
Description:	Face (ft.)	Face (ft.)	Face (ft.)	N side (ft.)	S side (ft.)
Dimensions	440	275	120	230	230
Depth of water	8.5 to 5.5	6.5 to 5.5	10.5	9 to 8	10 to 9
Berthing space available	440	275	120	230	230
Width of apron	Open wharf	Open wharf	30	50	20
Transit sheds:	None	None	1		
Length and width			210′ by 50′		
Total floor area			10,500 sq. ft.		
Mechanical handling facilities	No data	No data	No data		
Railway connections	None	None	None		
Water supply	No data	No data	No data		
Electric current	No data	No data	No data		
Estimated terminal capacity	100	50	175		

Reference on FIGURE VI - 127	④	⑤		
NAME	EAST QUAY, S SECTION	SOUTH PIER		
Location on waterfront	E side of harbor, between north and south piers.	E side of harbor, N side of river mouth.		
Owned and operated by	No data	No data		
Purpose for which used	General cargo, small craft and coastal steamers.	General cargo, coastal steamers.		
Type of construction	Believed masonry	No data		
Description	Face (ft.)	Face (ft.)	N side (ft.)	S side (ft.)
Dimensions	315	120	170	170
Depth of water	9	10.5	9.5	9.5
Berthing space available	315	120	170	170
Width of apron	Open wharf	40	35	35
Transit sheds:	No data	1		
Length and width		100′ by 50′		
Total floor area		5,000 sq. ft.		

TABLE VI - 39 *Continued*

PIERS, WHARVES, AND QUAYS AT EZUMI

Mechanical handling facilities	No data	No data
Railway connections	None	None
Water supply	No data	No data
Electric current	No data	No data
Estimated terminal capacity	100	150

(*c*) *Storage facilities.* Data are meager but there are believed to be numerous warehouses in the town, at the rear of the quays and piers, and along the north bank of the river. The rear of the north quay and the seawall southward from the river form a large area which is served by trucks only and could probably be used for supply dumps.

(*d*) *Capacity and clearance.* The estimated unloading capacity of the port is 575 short tons per day. In 1934, 8,874 steamships, with an aggregate registered tonnage of 108,730 tons, entered the port.

There are no railroad connections; the nearest railroad station is at Matsue, southeastward from Ezumi on the eastern shore of the lake, Shinji-ko. A road connects the 2 towns and other island points. The Sada-kawa river has its source in the lake, just westward from Matsue, and motor boats provide frequent communication between the 2 towns by means of this river.

(4) Hamada (34° 54′ N, 132° 04′ E).

Hamada, on the northwest coast of Honshū, is the center of an important fishing industry but no deep draft facilities are available. Hamada-kawa, a shallow river, accessible only to small boats, flows through the town and empties into Matsuhara-ura.

(*a*) *Harbor.* The harbor, a natural bay open to the westward, is formed in an indentation in the coast between Kuro-saki and Nyūdō-hana (FIGURE VI - 128). It is about 2 miles in length and about 1¼ miles deep. It is protected by Uma-shima and other islets about 1 mile off the northern part and is well sheltered from all but westerly winds. The principal parts of the harbor are the inner harbor, known as the "Fishing Harbor," protected by breakwaters; Seto-wan on the eastern side of Setoga-shima; and Tono-ura.

The inner harbor is formed by a breakwater extending about 150 feet north-northwestward from Tsuru-shima and by another extending south-southwestward for about 600 feet from the same islet. A third breakwater extends north-northwestward from the shore at Odaiba-hana for about 600 feet. The opening, between the southern and northern extremities of the latter 2 breakwaters, is about 150 feet. A groin connects Yebisu-saki, a point near the northwestern end of the town's waterfront, with Tsuru-shima, an islet about 450 feet westward from it. The enclosed water area is about 45 acres. The average depths range from 3 to 1½ fathoms; shallower depths are found in the small fish boat basin in the southeast corner, and along the southern shore.

The Seto-wan harbor is shallow and separated into 2 parts by what is believed to be a causeway crossing the narrow channel between Setoga-shima and the mainland. The southern part, about 300 yards long in a north – south direction and 150 yards wide, has depths ranging from 2½ to ½ fathoms. A small fish boat basin, on the western side of this harbor, has depths of about ½ to ¼ fathom. The small northern part, partly enclosed by 2 jetties at the northern end, is also used as a fishing craft basin. The shores on both sides have been improved.

Tono-ura is the northern inlet of Hamada-kō, indenting the coast southward of Nyūdō-hana for about one-half mile, widening at the head into a shallow basin known as Matsuhara-ura. The width is about 300 yards at the northern end and over 500 yards at the head. An arm of Tono-ura, with depths of 2¾ to 1¼ fathoms, extends northward and then eastward; its total length is about ½ mile. The depths in the outer or main part range from 10 fathoms at the entrance to 2¾ fathoms in Matsuhara-ura.

The outer part of the main harbor, westward from the town and inner harbor, has depths ranging from 17 fathoms at the western entrance to 4 fathoms off the inner harbor.

There are 2 entrances to the main harbor and 1 to Tono-ura. The main entrance from the westward, between Kuro-saki on the south, and Uma-shima and other islets on the north, is about 1½ miles wide. A reef lies in the center of the entrance.

The entrance from the north, between Uma-shima and Yana-shima, and the western side of Setoga-shima, has a least width of about 400 yards with depths of 6¾ to 12 fathoms. This channel has a navigable width of about 300 yards due to several detached rocks and obstructions in the fairway. The entrance to Tono-ura, between Nyūdō-hana and Tapa-saki, is about ¼ mile wide but has some obstructions in the fairway. The depths in general are 12 to 16 fathoms but the least swept depth is 18 feet over the shoals.

The best anchorage in Hamada-kō lies off the inner harbor in depths of about 7 fathoms over sand, with Tsuru-shima light bearing 74° and the western extremity of Setoga-shima bearing 339°. During strong westerly winds there is good anchorage in Nagahama-kō, the southern arm of Hamada-kō, where sheltered anchorage can be found in depths of about 6½ fathoms, over sand, with Tenjin-shima bearing 125° distant about 500 yards. Small craft can find good anchorage in Seto-wan or Tono-ura, in depths ranging from 2½ fathoms in the former to 4 or 5 fathoms in the latter, over mud. There are 2 first-class anchorages off the inner harbor, and 1 first-class and 2 second-class anchorages in Nagahama-kō.

The lunitidal interval at Hamada-kō is 11 hours, 27 minutes; springs rise 1¼ feet, and neaps 1 foot.

In the vicinity of Hamada-kō, northeasterly winds prevail; winds from the southwest are next in frequency. Southeasterly winds are uncommon. During the winter, winds from the westward predominate, but from March to November the direction

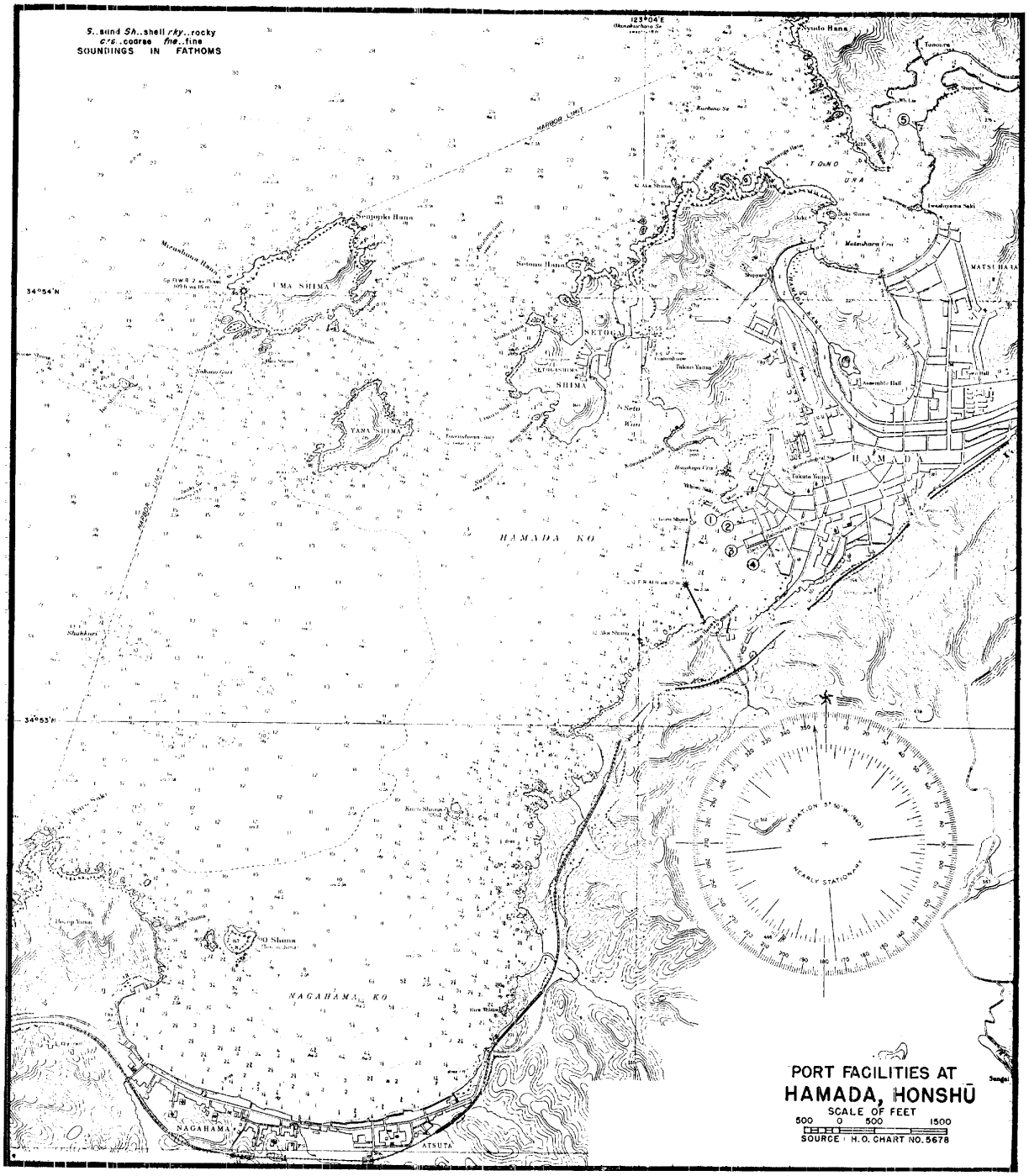

FIGURE VI - 128. *Hamada.*
Map of harbor showing location of port facilities by encircled reference numbers.

is mainly northeasterly. The mean wind velocity reaches a maximum of 15 feet per second in December and January; the minimum of 8.5 feet per second occurs in June. Thick fogs develop only occasionally and do not last long. The sea is generally calm from May until the latter part of October.

The mean annual temperature is 58.2°; the mean maximum is 65.5°; and the mean minimum 51.3°. The mean relative humidity is 73 per cent. The annual precipitation was 64.72 inches, falling on 191 rainy days. The maximum daily rainfall in 24 hours was 8.92 inches, falling in August.

(*b*) *Landing facilities.* There are about 3,860 linear feet of quays and wharves in the harbor; only 610 linear feet have depths alongside of over 10 feet (FIGURE VI - 106). The remainder are shallow with depths of 3 to 9 feet alongside. The

fish pier (Reference ③) in the inner harbor has depths of 9 to 11 feet alongside. There is a landing on the eastern side of Seto-wan near the customhouse and there are a number of shallow-depth, small piers and wharves at Nagahama and Atsuta in the southern part of Hamada-kō. It is also possible to use the beach at Matsuhara in the southern part of Tono-ura. The known details of the principal wharves and piers are listed in TABLE VI - 40.

TABLE VI - 40

PIERS, WHARVES, AND QUAYS AT HAMADA

Reference on FIGURE VI - 128	①	②	③		
NAME	NORTH QUAY	EAST QUAY	FISH PIER		
Location on waterfront	NE corner of inner harbor	Between north quay and pier on E shore	Projects from middle of E shore of harbor		
Owned by and Operated by	No data	No data	No data		
Purpose for which used	Oil fueling, fishing craft.	General cargo, fish handling.	General cargo, fish handling.		
Type of construction	Believed masonry	Believed masonry	No data		
Description:	Face (ft.)	Face (ft.)	Face (ft.)	N side (ft.)	S side (ft.)
Dimensions	150	360	140	300	300
Depth of water	6	9	11	9.5	11 to 10.5
Berthing space available	150	360	140	300	300
Width of apron	Open wharf	Open wharf	50	25	25
Deck above	No data	No data	No data		
Capacity per sq. ft. (lbs.)	No data	No data	No data		
Lighted or unlighted	No data	No data	Lighted		
Transit sheds:	No data	1	1		
Type of construction		No data	No data		
Length and width (feet)		230 by 65	250 by 90		
Total floor area (sq. ft.)		14,950	22,500		
Number of floors		No data	No data		
Height between floors		No data	No data		
Allowable load per sq. ft. (lbs.)		No data	No data		
Lighted or unlighted		No data	Lighted		
Mechanical handling facilities	No data	No data	No data		
Railway connections	None	None	None		
Water supply	No data	No data	Available on pier		
Electric current	No data	No data	No data		
Estimated terminal capacity	30	100	200		

Reference on FIGURE VI - 128	④	⑤
NAME	FISHMARKET BASIN	TONO-URA WHARF
Location on waterfront	SE from fish pier	E side of Tono-Ura N arm
Owned by and Operated by	No data	No data
Purpose for which used	Fish handling, small craft.	No data
Type of construction	Believed masonry	Believed masonry
Description:	Face (ft.)	Face (ft.)
Dimensions	190 + 200	120 + 200 + 200
Depth of water	4 to 6	20 to 10
Berthing space available	190 + 200	120 + 200 + 200

TABLE VI - 40 *Continued*

PIERS, WHARVES, AND QUAYS AT HAMADA

Width of apron	Open wharf	Open wharf
Deck above	No data	No data
Capacity per sq. ft. (lbs.)	No data	No data
Lighted or unlighted	No data	No data
Transit sheds:	No data	1
Type of construction		No data
Length and width (ft.)		110 by 30
Total floor area (sq. ft.)		3,300
Number of floors		No data
Height between floors		No data
Allowable floor load per sq. ft. (lbs.)		No data
Lighted or unlighted		No data
Mechanical handling facilities	No data	No data
Railway connections	None	None
Water supply	No data	No data
Fire protection	No data	No data
Electric current	No data	No data
Estimated terminal capacity	—	200

(*c*) *Storage facilities.* The north quay in the inner harbor has about ½ acre of open storage space on it. The wharves in Seto-wan and the Setoga Channel have about 2 acres of open storage space at their rear. The race track area has about 6 acres of open space which could probably be used. All are accessible to truck and lighters but have no railroad connections.

(*d*) *Capacity and clearance.* The estimated capacity of the port is 530 short tons per day.

The town is served by a branch of the State Railways with connections to Matsue and Masuda. Roads from the wharves and piers at Hamada connect to the highway system.

(*e*) *Supplies.* Water is piped onto the pier in the inner harbor and is obtainable at the rate of 10 tons per hour. Fuel oil is obtainable at the north quay in the inner harbor at the rate of 10 tons per hour.

(*f*) *Repair facilities.* In Tono-ura, there is a drydock which can handle vessels up to 100 gross tons weight. This dock is located in a small inlet on the eastern side of the northern arm of Tono-ura. A small shipyard is located in the southwest corner of the inner harbor.

(5) ***Senzaki*** (34° 24′ N, 131° 12′ E).

Senzaki, on the western part of the northwest coast of Honshu, is an export point for coal and timber. It is on the extremity of a peninsula which separates Senzaki-wan and Fukawawan; the port works and commercial activities are on the eastern side. Only 1 pier has a depth of 18 feet at the end; the remainder of the facilities have shallow depths alongside.

(*a*) *Harbor.* Senzaki-wan, a sound about 3 miles long and about 2 miles wide at its middle part, is protected on the northern side by 3 islands, Omi-shima, O-shima, and Sasa-shima (FIGURE VI - 129). Within the sound the depths range from 10 to 20 fathoms. Senzaki-kō, in the southwestern part of Senzaki-wan, is a nearly landlocked bay. About 1 mile wide, it indents for about 1.5 miles, and is well sheltered from all winds. It has general depths of from 5 to 8 fathoms, but at its southern end the depths are 3½ to 4 fathoms; off the town the depths are under 5 fathoms.

The inner harbor is formed by a breakwater extending southward about 250 yards from Benten-shima, a small islet about 250 yards offshore. Another short detached breakwater, about 250 feet long, extends west-southwesterly from a point just west of the southern extremity of the first breakwater. The 12-acre harbor thus formed has central depths of 3¼ to 5 fathoms.

The entrance to Senzaki-kō through Senzaki-wan is about ¾ mile wide between Senganse-hana and Yaumi-hana, the northwestern and southwestern entrance points respectively. The depths in the entrance are 8 to 11 fathoms.

Senzaki-seto, a narrow channel which joins Senzaki-kō and Fukawa-wan, leads between the tip of the peninsula on which the town stands and the southern coast of Omi-shima. It is the usual route taken by small coastal and fishing vessels drawing less than 10 feet. There are no obstructions in the channel but shoals lie off the western approach. The general depths in the channel range from 3½ to 8 fathoms. The channel is about ½ mile long and the least width is about 150 yards.

The entrance to the inner harbor from Senzaki-ko is through the southern side between the small detached breakwater and a jetty extending from the shore; the width is about 100 yards and depths are 3½ fathoms.

Vessels can anchor about ½ mile southward from Benten-shima and off the oil tank farm in depths of about 4½ fathoms, but the holding ground is reported to be poor. Safe anchorage can be found in Senzaki-wan on the northern or southern sides, according to wind direction, in from 10 to 15 fath-

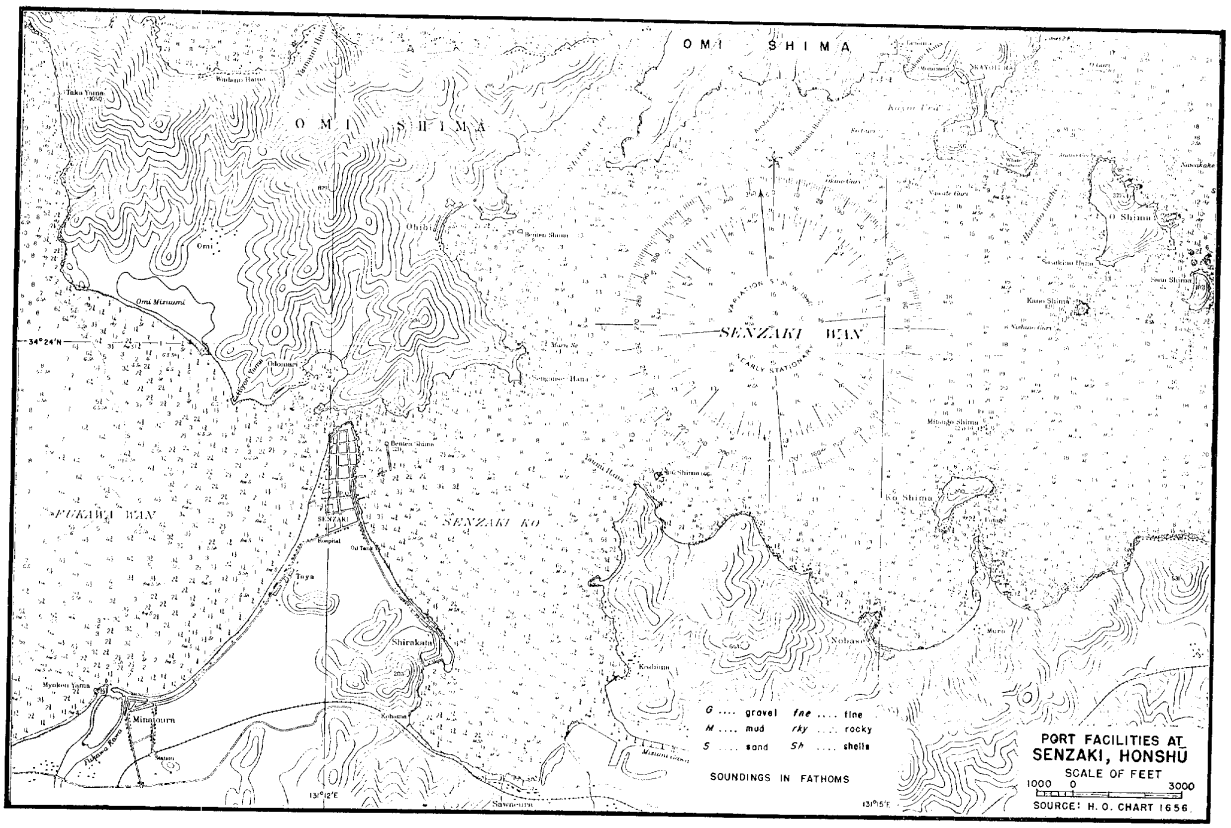

FIGURE VI - 129. *Senzaki.*
Map of harbor.

oms, over sand and mud bottom. There are probably 18 to 20 first-class and 12 to 15 second-class anchorages in Senzaki-wan and Senzaki-kō.

The lunitidal interval at Senzaki-kō is 10 hours, 36 minutes; springs rise 2½ feet, and neaps 2 feet. In Senzaki-seto, the easterly flowing current attains a maximum velocity of about 2 knots, and flows from about 4 hours before high water until about 2 hours after high water. The westerly flowing current may attain a velocity of 1 knot. At the change, there may be irregular currents for 1 or 2 hours, or slack water for about 15 minutes.

Westerly winds are predominant on this coast during December and January, but thereafter northeasterly winds are most common, even during summer. However, some southwesterly winds occur in summer. The mean annual wind speed is 7 knots, with a mean of 9 knots in December and 5 knots in June. The annual precipitation in the vicinity is about 64 inches; June, July, and September are the rainiest months. The plum rains fall in early summer and the typhoon rains in September. Fogs are infrequent, occurring on about 4 days annually.

(*b*) *Landing facilities.* The waterfront inside the breakwaters has a number of small piers and wharves, all of which have shallow water alongside. A pier at the south entrance to the inner harbor, about 300 feet long and 30 feet wide, has depths of 18 feet at its end. Three other piers farther south and opposite the coal storage and several small wharves adjoining them constitute the facilities of the port. In addition, there are 3 fueling piers at the oil tank farm farther south. The piers in general have depths of about 8 feet at their ends and are believed to be of timber construction. It is probable that the oiling piers have pipe line facilities, but the coal is probably handled by basket.

(*c*) *Storage facilities.* Warehouses probably are at the rear of the piers and wharves. It is believed that ample open storage space is available at the rear of and adjoining the oil tank storage southward of the town. This area is served by the railroad and roads.

(*d*) *Clearance.* A branch of the State Railways serves the port and town. Roads lead from the wharves and piers to the town and connect to the highway system of the island.

(*e*) *Supplies.* It is reported that the Misumi-kawa, which enters the southeast corner of the harbor, is used as a source of water supplied to vessels by water boats. Several oil tanks are located southward of the town, adjoining the coal storage. Three small fueling piers project seaward from in front of the tanks. Several coal storage dumps are located southward of the town. Piers project seaward opposite each dump. It is reported that ships can be loaded at the rate of 800 tons per 24 hours.

(6) *Ube* (33° 57′ N, 131° 15′ E).

Ube is in the north central part of Suo-nada, part of the Inland Sea, on the southwestern coast of Honshū, eastward from Shimonoseki. It is the center of a coal mining area and a coal exporting port. A number of landing facilities are available but depths alongside are 10 feet or less.

(*a*) *Harbor.* The harbor is composed of an outer and inner harbor (FIGURE VI - 130). The outer harbor in the bay between Ube-misaki and Motoyama-hana is 5¾ miles wide and indents the coast 2½ miles. The Koto-gawa discharges into the head of the outer harbor. The northern and northwestern part is fronted by a mud bank which dries to a distance of about 1 mile. The depths in the outer harbor are less than 3 fathoms in most parts except in the central part where they range between 3 and 4 fathoms.

The inner harbor in the northeastern part of the outer harbor fronts the town and is artificially protected by 3 breakwaters. The eastern breakwater enclosing the inner harbor is about 180 yards long; the western breakwater is 340 yards long; and the detached southern breakwater is 875 yards long. The inner harbor is about 1,700 yards long and varies in width from 1,500 to 900 yards. The depths decrease generally from about 13 feet in the southern part to 3 feet in the northern part. The Shin-kawa discharges into the northeastern side of the inner harbor.

A basin, about 95 yards long and 65 yards wide with charted depths of 3½ to 9½ feet, is located in the east central part of the outer harbor, immediately westward of the inner harbor. It has an entrance width of about 35 yards, and a charted depth of 9½ feet.

A channel, about 940 yards long and 90 to 150 yards wide with a charted controlling depth of 12¼ feet, leads to a basin approximately 200 by 415 yards, with charted depths of 13 to 21 feet, immediately northward of the east central basin in the outer harbor.

Another basin, located in the southeastern part of the outer harbor immediately southeastward of the inner harbor, is about 350 yards long and from 125 to 80 yards wide, with charted depths of 3½ to 15 feet. The entrance width is about 85 yards with charted depths of 9¼ to 10¼ feet.

The entrance to the outer harbor is clear and free of dangers, except for wrecks some distance offshore. The entrance to the inner harbor between the eastern and southern breakwater is about 100 yards wide, with charted depths of 14½ feet. The entrance between the western and southern breakwaters is about 160 yards wide, with charted depths of 15½ feet. The approach to the southwestern entrance through the outer harbor, has a charted controlling depth of 13½ feet; the approach to the eastern entrance has a depth of 10¾ feet.

The outer harbor affords sufficient room for about 104 third-class anchorage berths.

The mean high water interval at Ube is 8 hours, 47 minutes. Springs rise approximately 12.2 feet above lowest low water, and neaps 9.2 feet. The flood current 4¾ miles offshore at Ube sets west-northwestward with a velocity of 1¼ knots; the ebb current sets south-southeastward at 1¾ knots.

(*b*) *Landing facilities.* A number of landings are available, mostly in depths of 10 feet or less, in the inner harbor and the small boat basins adjacent to it. A quay and a pier with respective depths of 18 and 13 feet alongside are in the western part of the outer harbor, but a definite location cannot be determined. Three piers, each about 70 feet long with charted depths of 6¼ to 7½ feet at their heads, are in the east central basin in the outer harbor. Eight piers, 3 of which have T-heads and 1 an L-head, ranging in length from about 65 to 130 feet with charted depths of 6½ to 9½ feet at their heads, are in the southeastern basin in the outer harbor.

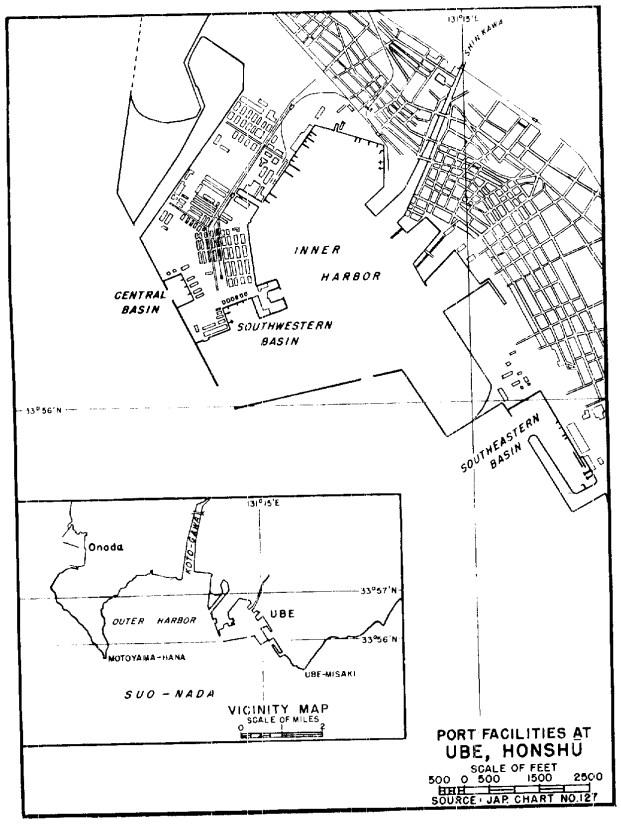

FIGURE VI - 130. *Ube.*
Sketch of harbor.

Three piers, each about 50 feet long, are on the northwestern side of the southwestern basin in the inner harbor. The westernmost of these piers had a charted depth of 8 feet along its eastern side. Two other piers, each about 125 feet long with charted depths of 8 and 12¼ feet at their heads, are on the western side of this basin. These 2 piers were widened on both sides a short distance inshore from their heads, and narrowed again at their heads to the regular width.

A slip, about 550 feet long and 120 feet wide, with charted depths of 5½ to 10½ feet, is on the northwestern side of the inner harbor. Eleven piers, ranging in length from about 40 to 265 feet, with charted depths of 3½ to 13¾ feet also are on this side of the inner harbor. A railroad track serves the rear of a building which adjoins the 2 longest of these piers. A slip, about 150 feet long and 65 feet wide, is on the northern head of the inner harbor. Four piers, each about 65 feet long with charted depths of about 7 feet at their heads, is on this same side of the inner harbor.

Three piers, each about 125 feet long with charted depths at their heads of about 6½ feet, are at the northeastern side at the head of the inner harbor. One of these piers has a large angle at about its midpoint, and the other 2 piers are similar to those on the western side of the southwestern basin. A railroad track serves the roots of these piers. A floating pier, about 285 feet long with charted depths of 6½ to 12½ feet alongside, is on the northeastern side of the inner harbor, immediately off the mouth of the Shin-kawa on the left bank.

Ube is a regular port of call by vessels of the Ōsaka-Sanyō

Line. A local railway connected the port with the Ube station of the Sanyō Line, and electric cars ran westward to Onoda. It also is on an improved coastal highway. Water is piped to the principal wharf.

(7) Kudamatsu (33° 59′ N, 131° 52′ E).

Kudamatsu is on the southwestern coast of Honshū at the head of Kasado-wan in the northeastern part of Suo-nada, a part of the Inland Sea. It is a short distance eastward of the Tokuyama Minor Naval Station; Kasado-wan, the small bay that fronts Kudamatsu, lies within the limits of the naval port. The naval facilities at Tokuyama, including several commercial piers, are described in Chapter XIII, Topic 133, C.

Kudamatsu is fronted by a series of walled salt pans. Miyanosu-hana, a narrow tongue of land extending west-southwestward from the southern end of the town, is the site of an oil refinery and storage installation. Thirty first-class and 30 second-class anchorage berths are available in Kasado-wan and 8 first-class anchorage berths are available southward of Miyanosu-hana. It is reported that several large wharves, with depths alongside sufficient to accommodate large vessels, have been built recently, but details are not available. The known landing facilities at Kudamatsu have depths of 12½ and 15 feet alongside, but an oil pier at Miyanosu-hana is believed to have 23 feet of water at the head.

(a) Harbor. Kasado-wan, a small bay lying between Kasado-jima and O-shima, is about 3¾ miles long and in general about 2 miles wide (FIGURE VI - 131). The greater part has depths of 6 to 8½ fathoms. Nakamochi, a mud bank covered by depths of 3 to 5 fathoms, lies nearly in the middle of the northern part of the bay and has seasonal growths of thick seaweed on it.

The southwestern or main entrance, between Katsune-saki on the south and Kochushi on the north, is about 1,350 yards wide with depths of about 8½ fathoms. In the approach, a chain of small islets and rocky shoals extends in an east – west direction, dividing the approach into 2 deep channels. A canal, 50 feet wide and accessible to small craft at high water, connects the northern part of Kasado-wan with the south-eastern part of Tokuyama-wan.

The southeastern entrance to Kasado-wan is through Miyano-seto, a deep water channel about 200 yards wide. An overhead cable, with a minimum clearance of 144 feet, spans Miyano-seto. A submarine cable crosses from Miyanosu-hana to a point southward of Seto-saki on Kasado-shima.

Miyano-seto is the harbor for the oil refineries on Miyanosu-hana. It is fronted by Kasado-shima and has general depths of 7 to 11 fathoms. Off the southern side of Miyanosu-hana, the 5-fathom contour lies about 125 yards offshore and the 10-fathom contour about 150 yards offshore.

Anchorage is available in Kasado-wan in depths of 6 to 8 fathoms, over mud bottom. There are believed to be about 30 first-class and the same number of second-class anchorage berths. Anchorage is available southward of Miyanosu-hana, in depths of 7 to 9 fathoms, mud and sand bottom. This area has about 8 first-class anchorages.

The lunitidal interval is 8 hours 42 minutes; springs rise 10.2 feet; neaps 7.5 feet; and the mean level is 5.9 feet.

In the main entrance to Kasado-wan the flood current sets eastward with a velocity of ½ knot and the ebb sets south-southwestward with a velocity of 1 knot. In Miyano-seto the flood and ebb tides set northward and southward, respectively, and both commence to turn about 1 hour before high and low water.

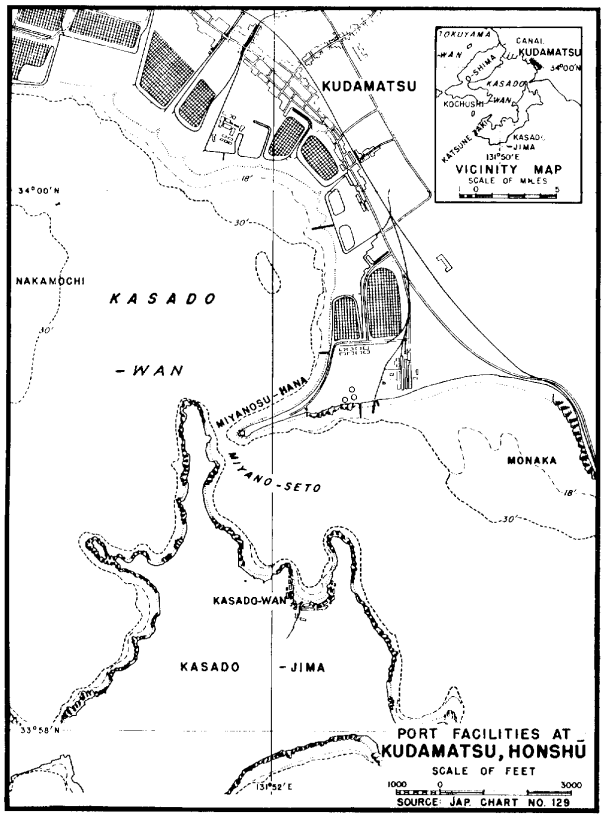

FIGURE VI - 131. *Kudamatsu.*
Sketch of harbor.

(b) Landing facilities. The principal facility at Kudamatsu, a pier about 500 feet long with charted depths of about 12½ feet at its head, projects westward from the southern part of the town. About 1,000 yards south of this pier, there is a second pier extending westward for about 250 feet with charted depths of about 16 feet at its head. This pier has railroad tracks near its root.

On the southern side of Miyanosu-hana fronting the refinery, are 3 piers. The westernmost of these piers is believed to be a 325-foot pile trestle in a depth of 23 feet of water at the head with a foot walk on which pipe lines are laid for fueling and receiving oil (FIGURE VI - 132). The 250-foot middle pier, believed to be more substantial, has a railroad track and a depth of 6½ feet of water at the head. The third pier, 125 feet long, is dry at the head during low water.

It is reported that several large wharves have been built recently and that railroad tracks are laid alongside. The depths alongside these wharves are believed to be sufficient to accommodate large vessels. The exact location of these wharves is unknown. The harbor is also reported being enlarged.

A number of warehouses serviced by railroads are shown at the refineries and at the rear of the southern pier in Kasado-wan.

(c) Supplies. The Japan Oil Company has 33 tanks with a capacity of about 31,200 barrels of gasoline and kerosene, and 1,160,400 barrels of crude oil. The Nippon Seiro has 28

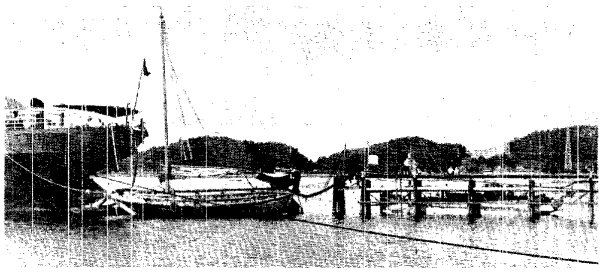

FIGURE VI - 132. *Kudamatsu.*
Oil pier at Miyanosu-bana, looking westward.

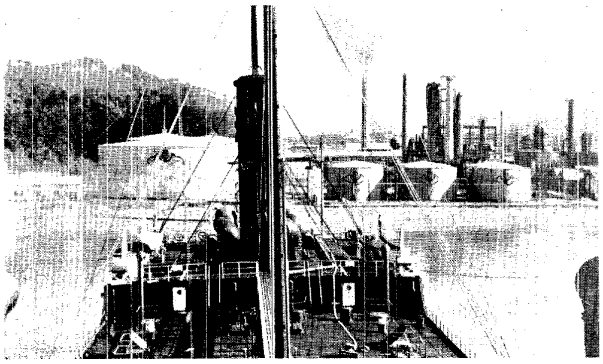

FIGURE VI - 133. *Kudamatsu.*
Nippon Seiro Refinery, looking northward.

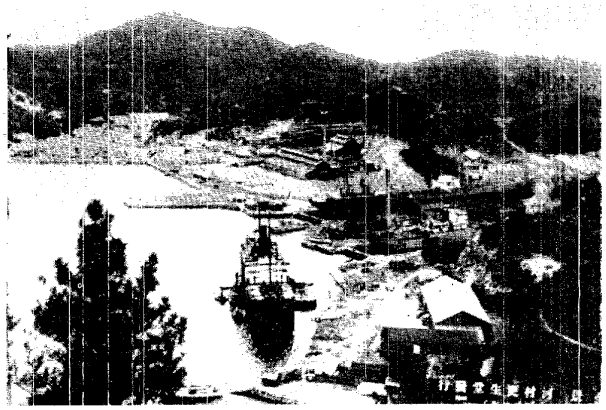

FIGURE VI - 134. *Kudamatsu.*
Shipyards at Eno-ura, looking northward. Two drydocks in foreground.

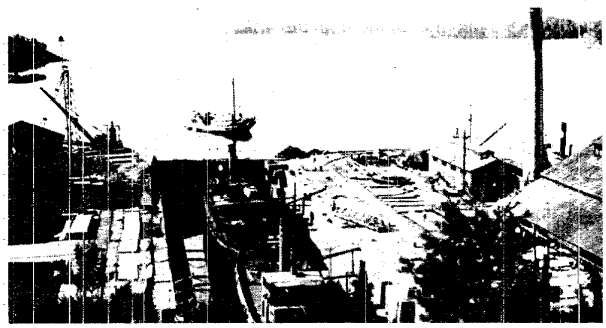

FIGURE VI - 135. *Kudamatsu.*
The smaller of the 2 drydocks at Eno-ura, looking westward.

tanks with a capacity for 211,800 barrels of crude oil (FIGURE VI - 133). The crude oil storage tanks are reported to be located about 2½ miles northward from the oiling piers.

(*d*) *Repair facilities.* There were 2 masonry drydocks at the head of Eno-ura, the eastern bight on the northwestern side of Kasado-shima (FIGURES VI - 134 and VI - 135). The dimensions are as follows:

No.	TOTAL LENGTH	WIDTH AT TOP OF GATE	DEPTH ABOVE BLOCK AT HIGH WATER
1	480	74	21.4
2	316	53.6	17.2

This yard also has submarine building facilities and shipways. It is reported that 8 tankers and four 3,000-ton cargo ships were under construction in 1941. It is also reported that the Kasado Dock Company has enlarged its facilities and that a new dock has been built.

(8) Murotsu-Kaminoseki (33° 50′ N, 132° 07′ E).

Murotsu is situated on the northern side of the strait, Kaminoseki-kaikyō, on the mainland, and Kaminoseki is on the southwestern side of the strait, on the island, Naga-shima, on the southwest coast of Honshū. The strait is between Suō-nada and Iyo-nada, parts of the Inland Sea. Anchorage is available, but only one pier has a charted depth of 30 feet off its head.

(*a*) *Harbor.* Murotsu-kō and Kaminoseki-kō are, respectively, on the northern and southern sides of Kaminoseki-kaikyō, the strait that leads between the southwestern point of Murotsu-hantō and the northeastern side of Naga-shima (FIGURE VI - 136). It is used by many sailing vessels and small steamers. The narrow part of the channel is about 400 yards long, in an east – west direction, and has depths of 5 to 6½ fathoms in midchannel, but does not exceed 100 yards in width. The navigable channel is reduced to a width of about 50 yards by shoal water on both sides.

Fronting Kaminoseki the 3-fathom contour lies about 40 yards, and the 5-fathom contour about 100 yards offshore. On the Murotsu side of the strait, the 3-fathom contour lies about 45 yards off the town, and the 5-fathom contour is generally only a short distance farther out. Small steamships with a number of coal barges or sailing vessels in tow often pass through this strait, and it is reported that numerous sailing vessels run aground in the passage.

Vessels can find anchorage, out of the tidal streams, in depths of 4½ to 12 fathoms, over mud bottom, off the waterfront of Murotsu, between the northern and southern piers. Similar anchorage can be found in a depth of 11 fathoms, over mud bottom, about 200 yards off the waterfront of Kaminoseki. During strong northwesterly winds, temporary anchorage can be found in depths of 1½ fathoms to 11 fathoms, over sand bottom, about 600 yards eastward of the lighthouse at Murotsu, but in depths less than 3 fathoms there are rocks on either side of the anchorage. Fuku-ura, northwestward of Kaminoseki, affords shelter from southwesterly winds, in depths of 8 fathoms, over sand bottom about 200 yards westward of Ryuno-bana with Ryuno-bana in range with the northern pier at Murotsu.

The mean high water interval in Kaminoseki-kaikyō is 8 hours, 43 minutes. Springs rise approximately 9.2 feet above lowest low water, and neaps 6.9 feet. The flood tide sets east-northeastward through the narrow channel of Kaminoseki-

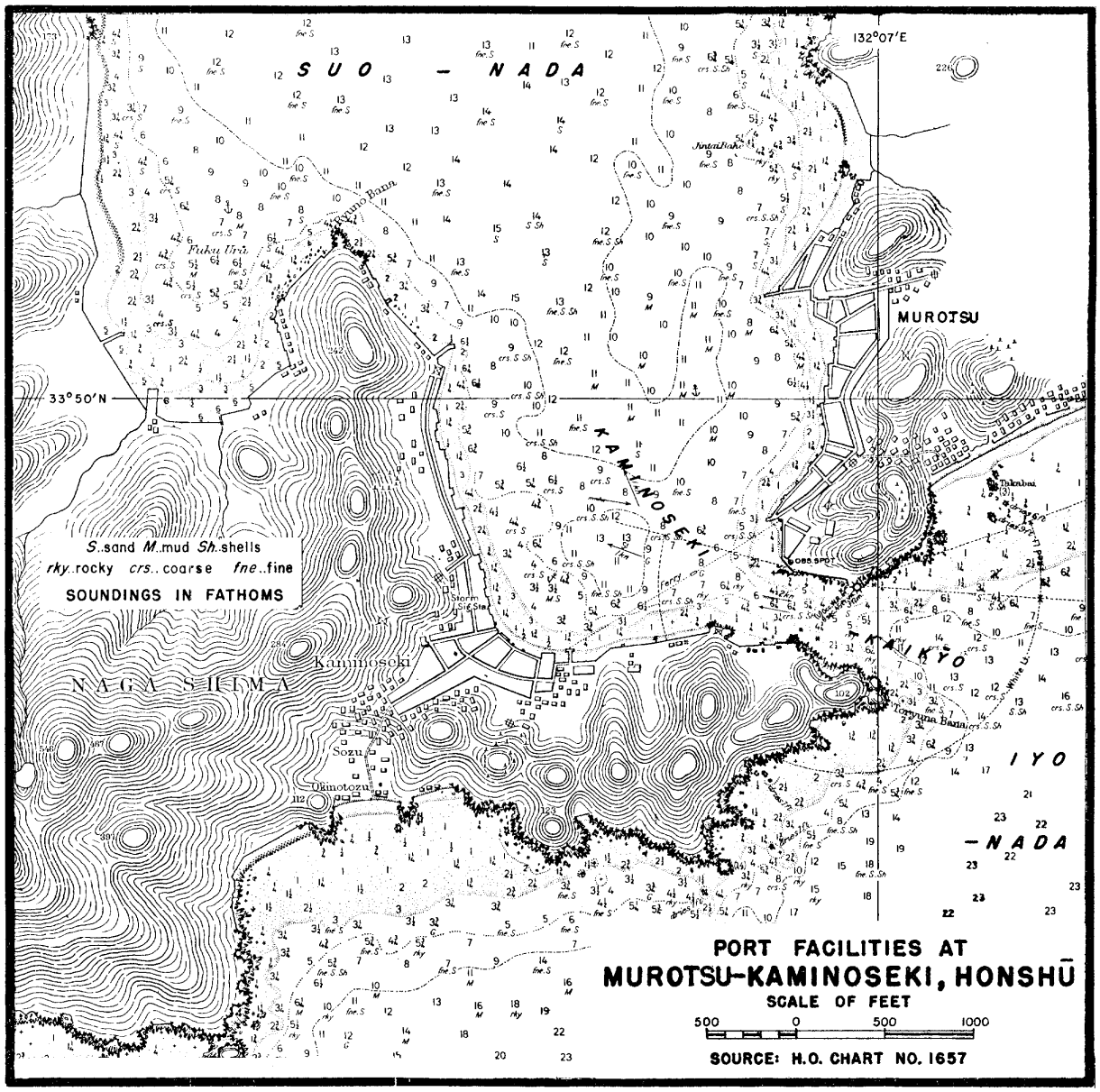

FIGURE VI - 136. *Murotsu-Kaminoseki.*
Map of harbor.

kaikyō with a velocity of 3¼ knots, 4 hours after it changes. The ebb tide sets westward, also with a velocity of 3¼ knots 3 hours after the tide changes.

(*b*) *Landing facilities.* The northern pier at Murotsu, about 40 feet long, has a charted depth of 30 feet off its head. The southern pier, about 65 feet long, has a charted depth of 14½ feet off its head. The T-head pier at the southeastern end of Kaminoseki, about 70 feet long, has a 65-foot head and a charted depth of 4½ feet along its face. The pier at the northern end of Kaminoseki, about 95 feet long, dries during low water. There are 2 piers on the western side of Fuku-ura; the southern one has an angle near its head, is about 125 feet long, and has a charted depth of 11 feet at its head; the northern one, about 75 feet long and 40 feet wide, dries during low water.

Murotsu and Kaminoseki are regular ports of call for the Ōsaka-Sanyō Line, and for motorboats which communicate with the islands of the vicinity. A ferry connects Murotsu and Kaminoseki. An improved road leads northward from Murotsu.

(*c*) *Supplies.* At Murotsu there is a waterworks which supplies water of good quality, and also a water boat. The daily capacity is 10 tons in summer and about 50 tons in winter. Well water, suitable for drinking, is used at Kaminoseki; there are no water supply facilities.

(9) Hiroshima (34° 21′ N, 132° 28′ E).

Hiroshima is in the northeastern part of Hiroshima-wan, in the northern part of Iyo-nada, part of the Inland Sea, on the southwestern coast of Honshū. The largest city in Honshū west

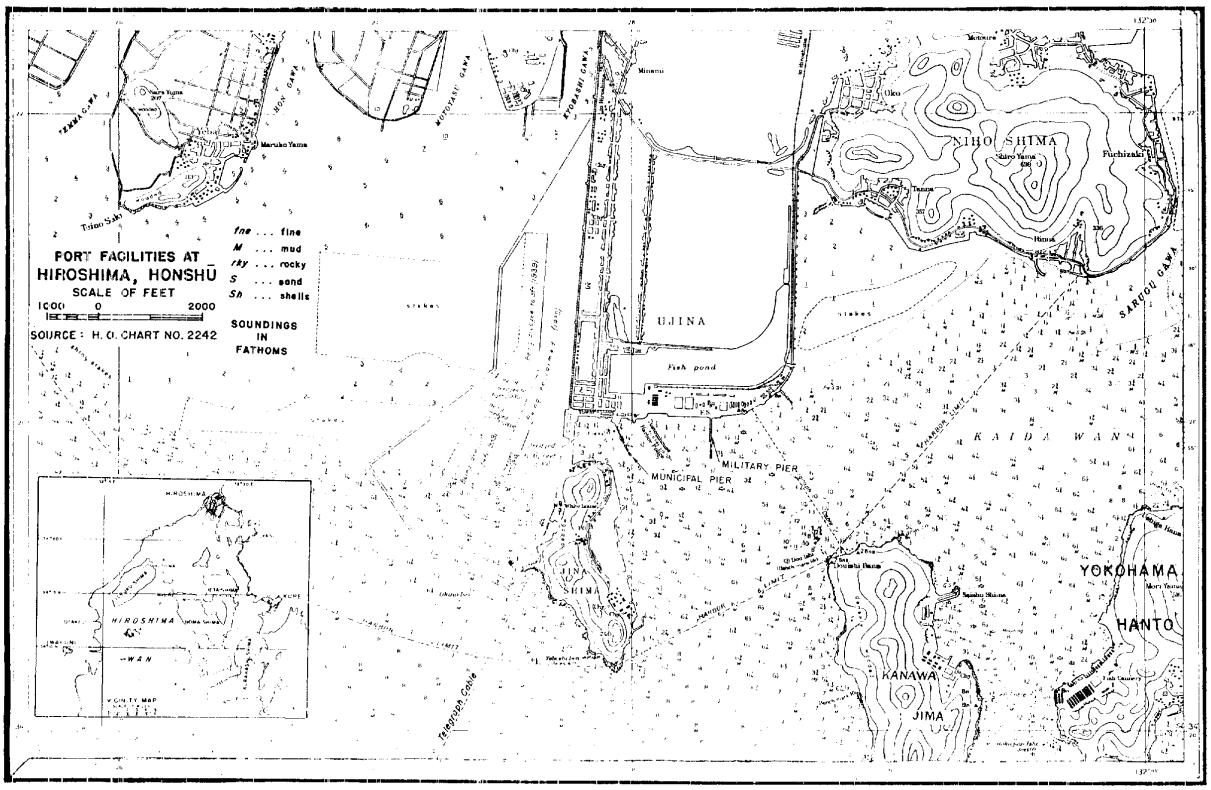

FIGURE VI - 137. *Hiroshima.*
Map of harbor showing location of port facilities.

of Kōbe, Hiroshima is about 2 miles northward of Ujina, a small village which serves as the port for the nearby city (FIGURE VIII - 43)*. A Military Transportation Depot is at Ujina and it is reported to be one of the principal ports of embarkation for the Japanese Army. Kure, a closed naval port, is near Hiroshima to the southeastward (CHAPTER XIII, Topic 133, O).

The Oto-gawa flows through Hiroshima through 5 branches: the Enko-kawa, Kyobashi-kawa, Motoyasu-kawa, Hon-kawa, and Temma-kawa; the last 4 discharge within the harbor limits. Only flat bottom boats can navigate this river during high tide; it cannot be used for military or other strategic purposes. Two piers have depths of 18 to 32 feet off their pontoon heads; an embarkation wharf capable of handling transports is reported but details are lacking.

(*a*) *Harbor.* An improved natural harbor, it is divided into eastern and western sections by Ujina-shima, an island in the central part (FIGURE VI - 137). Ujina-shima, ⅔ mile long in a north – south direction, is joined at its northern end to the town of Ujina by a causeway and a bridge. A telegraph cable is laid in a south-southwesterly direction from the middle of the western side of Ujina-shima to Nino-shima, and another is laid from the southeastern part of Ujina-shima to the northwestern part of Kanawa-jima.

Depths in the western section of the harbor decrease from 7 fathoms westward of Ujina-shima, to depths which dry during low water at the angle in the breakwater. Large areas, westward of the groin and breakwater, in the drying area of the harbor, are occupied by fish pound stakes. The depths in the eastern section decrease from about 6½ fathoms eastward of Ujina-shima to drying depths fronting Ujina. A large area eastward of Ujina, in charted depths which dry 1 to 2 feet, is occupied by fish pound stakes.

There was considerable harbor construction work in progress in 1939 in the western section. An angular groin, about 1,040 yards long, has been constructed westward of the reclaimed land on the western shore of Ujina. A right-angle detached breakwater, about 1,485 yards long, with a gap about 80 yards wide between its northeastern end and the groin, extends southwestward and southeastward from the end of the groin. Within the breakwater and groin, sections were being dredged, in 1939, to depths of 3, 6½, 16, 17, and 24 feet, as shown on the chart.

1. ENTRANCE CHANNEL. The entrance to the harbor is free of dangers, with the exception of Okino-iso, a rock with a depth of 6 feet over it, lying about 400 yards westward of the middle of the western side of Ujina-shima. The approach to the western section has charted depths of 8 fathoms; the western entrance to the eastern section, between Ujina-shima and Kanawa-jima, has charted depths of 6½ to 7 fathoms; and the eastern entrance to the eastern section, between Kanawa-jima and Yokohama-hanto, about 4½ fathoms.

2. ANCHORAGE. The best anchorage is in a depth of 4½ fathoms, 600 yards 160° from the head of the military pier northeastward of Ujina-shima, or farther to the southward in deeper water. Kaita-wan, an inner bay eastward of Ujina-kō, also affords sheltered anchorage in depths of 4 to 5 fathoms, in

*Town plan of Hiroshima, Chapter VIII.

good holding ground of mud bottom. Kaita-wan has about 13 second-class and 9 third-class anchorage berths. Ujina-ko, within the harbor limits, has about 2 first-, 10 second-, and 8 third-class anchorage berths. There were several mooring buoys off the military pier.

3. SIGNIFICANT HYDROGRAPHIC FEATURES. The mean high water lunitidal interval at Ujina is 9 hours, 33 minutes. High water of springs rises about 11¼ feet above lowest low water; neaps 8½ feet; and the mean tide level 6.6 feet. The flood current sets southwest and southeastward with a velocity of ¼ knot, varying in direction with the time, as shown on the chart. The ebb current sets southwestward at a rate of ½ knot, with its direction also variable with the time.

4. LOCAL WEATHER. The mean annual temperature at Hiroshima is 58.7°, the average extreme maximum 96°, and the average extreme minimum 17°. The total annual rainfall is 59.8 inches, with 134 rainy days per year. The prevailing winds are north, northeast, and southwest during winter, spring, and fall; and southwest, north, and south during summer with a velocity of 4 miles per hour during all seasons. There are 25 days per year with gales and 6.5 days with fog.

(*b*) *Landing facilities.* The municipal pier, in the western part of the eastern section, is about 600 feet long; the inner half has charted depths of 4½ to 7½ feet, with a small shoal (or rock) about 35 feet off the pier on the western side near the root, which dried 2 feet. The outer half of this pier is indicated on the chart as a pontoon, with depths of 18 to 32 feet. The military pier, eastward of the customhouse, is about 775 feet long; the inner 475 feet has charted depths of 4½ to 9 feet, with the inshore 100 feet drying during low water; the outer 300 feet of this pier is indicated as a floating pontoon, with charted depths of 9 to 18 feet.

Another pier about 340 feet long, at the southeastern part of Ujina, has charted depths at the inner 140 feet which dried during low water; the outer 200 feet, which is indicated as a floating pontoon, has charted depths of 1½ to 3 feet. The root of this pier was served by a railroad. It is reported that there is an embarkation wharf, about 1,200 feet long, alongside which transports could secure. The location of this wharf in the port is not known, but may possibly be on the east side of Ujina-shima.

There are several other small wharves in the harbor, but no details regarding them are available. Three piers are in the western section; 2 between the mouths of the Kyobashi-kawa and Motoyasu-kawa, one about 650 and 575 feet long, with charted depths which dried 4 feet during low water; the other, between the mouths of the Motoyasu-kawa and Hon-kawa, is about 225 feet long, with charted depths which dried about 6 feet during low water.

One oil tanker and 6 waterboats are based in the harbor.

(*c*) *Storage facilities.* It was reported in 1931 that there were only a few sheds and storehouses in the harbor of Ujina; cargo was sent by railroad to Hiroshima or by boat to other coastal towns in the vicinity.

(*d*) *Clearance facilities.* Electric cars and a harbor railway, used for freight, connect with the Sanyō Railway at the Hiroshima Railway station. There is regular steamship service to Dairen, Ao-shima, Korea, and Formosa, and frequent communication with neighboring islands and ports of the Inland Sea.

(*e*) *Supplies.* There are hydrants at 4 places in the harbor, and 6 water boats with pumps. There is 1 oil tanker with pumps in the harbor. On the eastern coast of an unidentified adjoining island, a fairly large area was used for coal yards.

(*f*) *Repair facilities.* Eight small drydocks are reported; the largest is 202 feet 7 inches long and 33 feet 7 inches wide (FIGURE VI - 138).

(10) Itosaki (34° 23′ N, 133° 06′ E).

Itosaki is on the southeastern side of Honshū Island. The town forms part of Mihara, on the northeastern shore of Mihara-

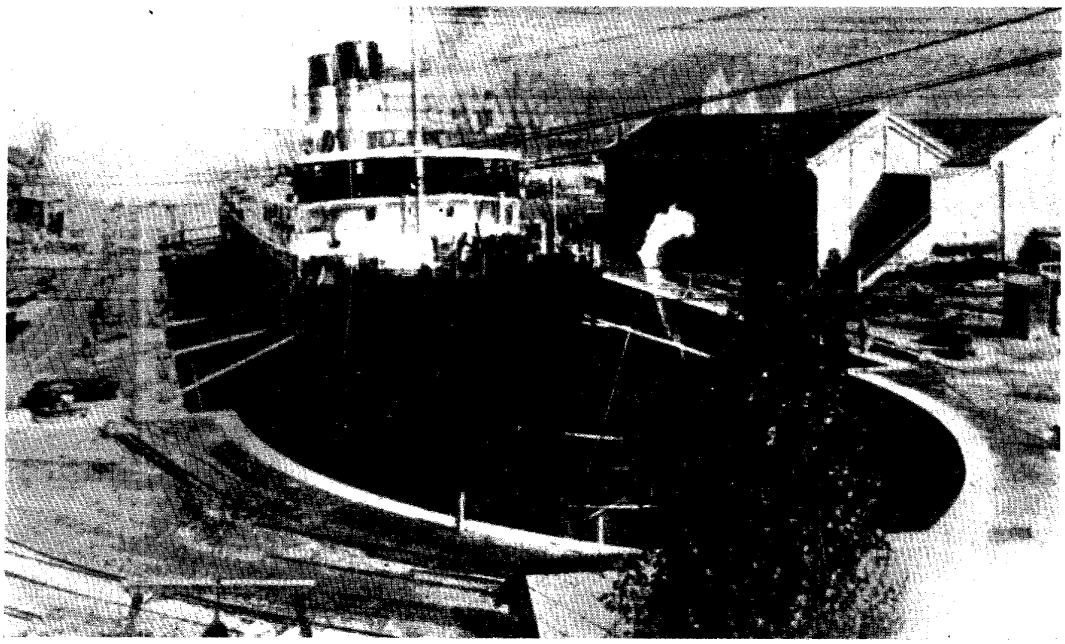

FIGURE VI - 138. *Hiroshima.*
Drydock No. 2.

wan, near Onomichi. It is the oil center for this part of the Inland Sea. Itosaki-ko, at the entrance to Mihara-wan, has partially protected anchorage and some piers with shallow water. There is a small boat basin at Itosaki with charted depths of 8 feet in the center, but the quays are fronted by drying shore banks.

(*a*) *Harbor.* Mihara-wan indents the northern side of Mihara-seto about 2 miles, but the head is filled with a drying mudbank (FIGURE VI - 139). A channel, with a dredged depth of 13 feet, leads to a basin in the town of Mihara. The basin has a dredged depth of about 9½ feet. The bay is open to southeastward but is protected by numerous high islands. The entrance is over 1½ miles wide and the bay is about 1 mile wide at the edge of the mudbank.

Depths in the outer bay are 10 to 14 fathoms. The inner part is 5½ to 10 fathoms deep. In Itosaki-ko depths are 3 to 12 fathoms. The Nuta-gawa flows into the western side of the head of the bay. On its northern side a long training dike extends to the edge of the mudbank.

Vessels can anchor in front of the town in suitable depths, avoiding the mudbank in the head of the bay. There was a mooring buoy about 200 yards southward of the end of the oil piers. In Itosaki-ko there is room for 7 first-, 2 second-, and possibly 2 third-class anchorage berths.

Tidal currents in the Mihara-seto are strong, reaching 4 knots. The flood sets eastward and the ebb westward. At Mihara-wan the east-going flood and the west-going ebb attain a velocity of 2½ knots.

At Kosagi-shima, across the channel from Mihara-wan, the mean high water interval is 10 hours, 50 minutes. Spring tides rise 11.2 feet, and neaps 8.5 feet.

(*b*) *Landing facilities.* The piers and quays at Itosaki extend from Ropponmatsuno-hana, the eastern entrance point, for about ¾ mile. In the outer part of the harbor are several small quays with depths of less than 10 feet. There is a landing pier on the outer side of the boat basin at Itosaki.

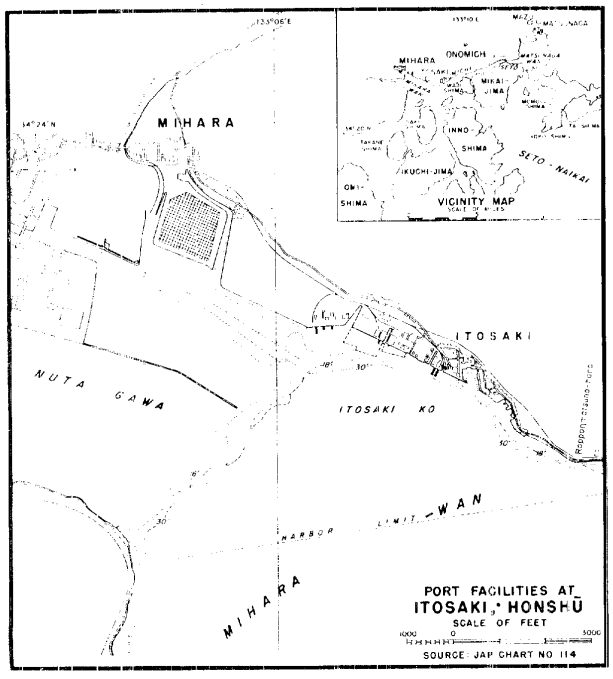

FIGURE VI - 139. *Itosaki.*
Sketch of harbor showing location of port facilities.

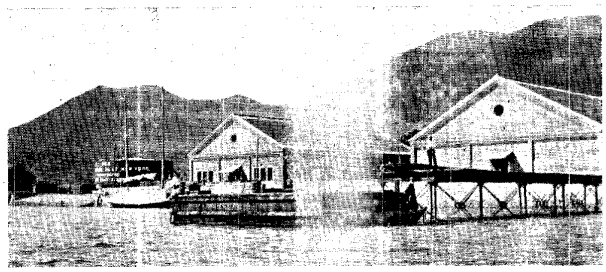

FIGURE VI - 140. *Itosaki.*
Oil pier, with mooring pontoon, looking northward, showing quay wall construction, landing ramp, warehouses, and oil storage tanks. 1911.

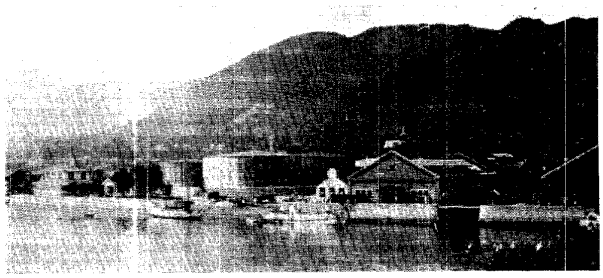

FIGURE VI - 141. *Itosaki.*
Quay W of oil piers, looking west-northwestward.

Westward of the basin are 2 oil piers, which project 110 feet from a masonry quay wall (FIGURE VI - 140). They are of open steel pile and timber deck construction and are spaced about 120 feet apart. Vessels berth abreast mooring pontoons which are provided at the head of each berth in depths of about 22 feet. There are two 8-inch and two 6-inch pipe lines on the northern pier, but none on the southern. The masonry quay wall continues westerly in front of the oil installation for nearly 600 feet (FIGURE VI - 141). The face is penetrated by narrow slips which front the warehouses. Depths alongside the quay are 6 feet or less. Vessels breast off the wall when berthed at the quay. There is a landing ramp, about 100 feet wide, in this section of quay.

The dredged basin at Mihara has a depth of 9.8 feet along 650 feet of quay wall on the western side and along 250 feet of the northern end. On the southern side of the 13-foot dredged channel to the basin there is about 1,100 feet of quay.

Large vessels anchor at Itosaki and transship to interisland vessels. The coastal railroad passes through Mihara and Itosaki to Onomichi (FIGURE VI - 142). Spur tracks lead to the piers and quays at Itosaki. Vessels of the Ōsaka-Sanyō and of the Onomichi-Imabari lines make scheduled trips to Itosaki.

(*c*) *Supplies.* Water is available and there is a water supply boat. In December 1941 there were 8 tanks having a total capacity of about 145,000 barrels (FIGURE VI - 143). Later reports indicated that considerable quantities of gasoline in drums were stored in this vicinity.

(*d*) *Repair facilities.* In 1940, a shipyard was reported under construction at Mihara. Two marine railways with lifting capacities of 500 tons each are reported.

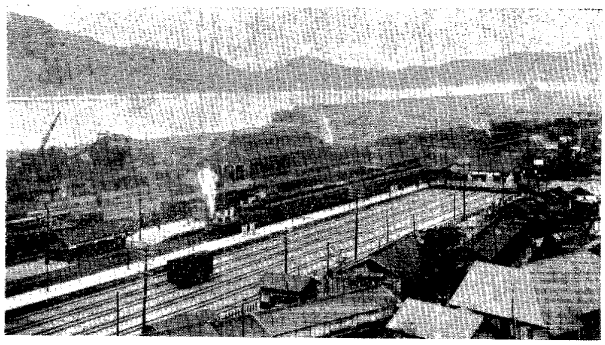

FIGURE VI - 142. *Itosaki.*
Railroad station and yards, looking southwestward.

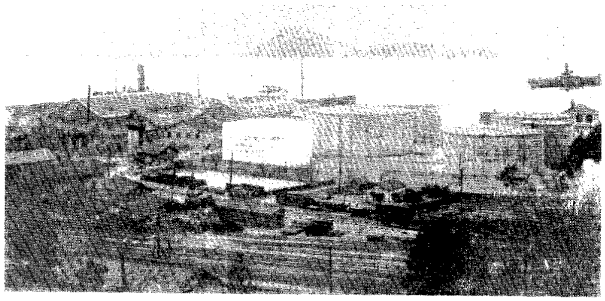

FIGURE VI - 143. *Itosaki.*
Oil storage installation.

(11) Habu (34° 36′ N, 133° 11′ E).

Habu is on the southwestern end of the island, Inno-shima, in the Hiuchi-nada, part of the Inland Sea, off the southeastern coast of Honshū. It is a ship building and repair center; and has drydocks that can handle battleships, carriers, small cruisers, and destroyers.

(a) Harbor. The harbor is in the southern end of the narrow Nagasaki-seto which separates Inno-shima from Ikina-shima (FIGURE VI - 144). The main approach is from the regular steamer lane in Mihara-seto, through Yuge-seto. Yuge-seto is entered from northeastward between Miga-saki on Inno-shima and Umatate-hana, the northeastern extremity of Yuge-shima, about 1 mile southeastward. Southwestward from Miga-saki is a bight formed by 2 points ½ mile apart. It indents about ¼ mile northwestward. Along this shore is the Mitsunoshō shipyard. Depths in Yuge-seto are 13 to 9 fathoms. Approaching the Mitsunoshō shipyard are depths of 4½ to 10 fathoms. The bight is nearly filled with a 1 to 3 fathom shoal.

Nagasaki-seto is about 880 yards wide at its southern entrance between the southern ends of the islands, Inno-shima and Ikina-shima. It narrows to about 290 yards opposite Habu, 1 mile northwestward. The controlling depth in Nagasaki-seto up to Habu is 5 fathoms. This channel is filled with numerous shoals and the depths along the waterfront of the shipyards and the town were charted at from 1 to 3 fathoms. Indications are that depths have been increased to provide adequate water in front of the shipyard.

At Habu the mean high water interval is 11 hours, 11 minutes. Spring tides rise 11.5 feet, neaps 8.8 feet. In the Nagasaki-seto the south-going flood current and the north-going ebb reach

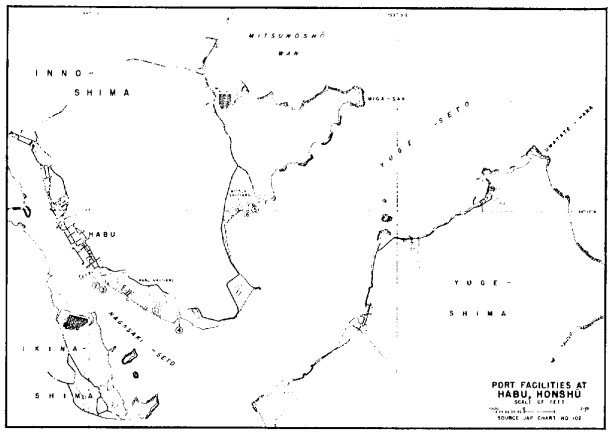

FIGURE VI - 144. *Habu.*
Map of harbor showing location of drydocks by encircled reference numbers.

2½ knots. In the Yuge-seto the northeast-going flood attains 1¼ knots and the southwest-going ebb 2¼ knots.

(b) Landing facilities. The Habu (Dosei) shipyard occupies the entire shore for about 1,500 yards from the southern extremity of the island to the southern edge of the city. There are no quays along the waterfront of the plant, but vessels come alongside close enough for a gangplank. In the vicinity several buoys were used for mooring and docking.

The basins and quays at Habu extend northward for a mile or more. Charted depths are shallow. Three T-head piers are charted along the town with depths of 7 to 22 feet. There are several hundred yards of improved waterfront or quays with depths of from 3 to 16 feet. The Mitsunoshō (Sannoshō) Shipyard Works extend for about 750 yards southwestward from the basin at the eastern entrance point of the bight. This small shallow basin is protected from the southeast by a breakwater. Between the drydocks near the basin and the slipways westward there is a quay about 600 feet long with depths of 10 to 11 feet. Some small piers project from it, one with a railroad track. Westward of the slipways is another small projecting railroad pier. There are several buoys, believed to be mooring buoys, in front of the drydocks at Mitsuno.

The harbor has several tugboats, ranging from 26 to 200 gross tons, and scores of lighters.

(c) Clearance facilities. The towns and shipyards are connected by roads and streets. Spur railroad tracks service the drydocks and slipways at the Habu (Dosei) and Mitsunosho (Sannoshō) works and the 2 yards may be connected. There are several small piers with tracks on them and tracks are laid along the quaywall in some places. Vessels of the Onomichi-Takehara line regularly visited the port.

(d) Supplies. At the Habu shipyard there is 1 water supply conduit and 1 pump type water supply boat.

(e) Repairs. Hull and machinery repairs of almost any nature could be made at the Ōsaka Iron Works shipyards on Inno-shima. The Habu (Dosei) dockyard repairs ships and engines and with the new graving dock can build or repair the heaviest naval units (FIGURE VI - 145). Most of the workshops date from the last war, but renovation and new construction was

going on in 1937 and 1938. The Sannoshō dockyard is smaller than the Habu yard and is believed to do no engine manufacturing, performing only minor repairs, and acting as an auxiliary yard for Habu. It was in disrepair for years, but resumed operations about 1936. It is equipped with 2 graving docks and workshops. In 1939, another shipyard was reported at Takuma-mura, Inno-shima, possibly at the northern edge of Habu. Known details of the drydocks are listed in TABLE VI - 41.

FIGURE VI - 145. *Habu.*
Habu (Sosei) shipyards, looking northwestward. 1933.

TABLE VI - 41

DRYDOCKS AT HABU

Reference on FIGURE VI - 144	①	②	③
NAME	DRYDOCK NO. 5	DRYDOCK NO. 4	DRYDOCK NO. 3
Owned and operated by	Osaka Ironworks Co.	Osaka Ironworks Co.	Osaka Ironworks Co.
Address	Habu (Dosei)	Habu (Dosei)	Habu (Dosei)
Location on waterfront	Nagasaki-seto	Nagasaki-seto	Nagasaki-seto
Type	Graving	Graving	Graving
Material	Stone	Stone	Stone
Width at coping	31′ 8″	58′ 10″	46′ 4″
Width at upper part of gate	32.2′	59′	46.6′
Width at bottom	28′ 1″	54′ 9″	42′ 7″
Length, coping head to side of caisson	—	—	—
Length on bottom	147′ 9″	449′ 4″	337′ 10″
Length, extreme	153′ 11″	462′	345′ 4″
Depth on keel blocks, M.H.W.	18.7′	20.3′	17.0′
Depth of sill below chart datum	—	—	—
Depth on sill, H.W.S.*	17	20	15
Height of sill above bottom of dock	—	3′ 3″	3′ 3″
Dif. between H.W.S. and N.*	10	10	10
Crane service	Available at shipyards	Available at shipyards	Available at shipyards
Capable of building	—	Small cruisers	Submarines or gun boats
Date built and/or rebuilt	—	Going on in 1937 and 1938	Renovation and new construction

Reference on FIGURE VI - 144	④	⑤	⑥
NAME	DRYDOCK NO. 8	DRYDOCK NO. 7	DRYDOCK NO. 6
Owned and operated by	Osaka Ironworks Co.	Osaka Ironworks Co.	Osaka Ironworks Co.
Address	Habu (Dosei)	Mitsunoshō (Sannoshō)	Mitsunoshō (Sannoshō)
Location on waterfront	Nagasaki-seto	Yuge-seto	Yuge-seto
Type	Graving	Graving	Graving
Material	Concrete	Stone	Stone
Width at coping (feet)	95.4 or 96	42	57
Width at upper part of gate	—	50	57.1

*Ordinary tides (feet).

TABLE VI - 41 *Continued*

DRYDOCKS AT HABU

Width at bottom (feet)	90	38	50′ 10″
Length, coping head to side of caisson (feet)	767.4	—	—
Length on bottom (feet)	750**	291	413′ 10″
Length, extreme (feet)	768	300	420′ 7″
Depth on keel blocks, M.H.W. (feet)	—	16.4	20.3
Depth of sill below chart datum	18.7	—	—
Depth, on sill, H.W.S.*	31	14′ 9″	18
Height of sill above bottom of dock, (feet)	3′ 0″	4′ 7″	2′ 8″
Dif. between H.W.S. and N.*	10	10	10
Crane service	Available at shipyards	Available at shipyards	Available at shipyards
Capable of building	Battleships or carriers	Submarines or gunboats	Destroyers
Date built and/or rebuilt	1937	Prior to 1930	Prior to 1930
Remarks			

*Ordinary tides (feet).
**Also given as 721.6 from caisson to head; cut from solid rock.

*(12) **Onomichi*** (34° 24′ N, 133° 12′ E).

Onomochi is on the south coast of Honshū at a midpoint of the Inland Sea. The town is a boat repair center; a number of minor wharf facilities are available in depths less than 15 feet.

(a) Harbor. The harbor is not accessible to large ships and is accessible to medium-sized vessels only from the westward (FIGURES VI - 146 and VI - 147). The channel near the eastern end is shallow. The width varies from 500 yards to 200 yards between zero tide lines with central depths in general from 6 to 1¼ fathoms. There is a small 10-fathom area immediately beyond the shallowest part of the harbor near its eastern end. Three ferries cross the channel within the city limits.

After allowing for an adequate fairway for ferries and other craft, and clearance space for the submarine cable, small craft can anchor at any place in the channel in depths of 1¼ to 6 fathoms over sand and shells. One mooring buoy was located opposite a midpoint of town.

The tide is semidiurnal with a lunitidal interval of 11 hours, 03 minutes. The spring rise is 11.8 feet and the neaps rise 9.2 feet above datum of soundings. Currents flow easterly on the flood and westerly on the ebb with mean velocities of 2¾ and 2¼ knots, respectively.

(b) Landing facilities. Six T- and L-head piers at the port provide about 1,140 feet of berthage in varying depths as listed in TABLE VI - 42.

Another pier (Reference ②) has a T-head, about 120 by 20 feet, but there is no water alongside at low tide. In addition, facilities were under construction in 1937 for the accommodation of 3,000-ton ships. There are 6 ferry landings for the 3 ferry lines, with depths alongside of less than 3 feet.

Warehouses and transit sheds apparently are available. Onomichi is on the highway and railroad nets of Honshū. The town was formerly a port of call for interisland steamships.

FIGURE VI - 146. *Onomichi.*
Harbor, looking eastward.

TABLE VI - 42

BERTHAGE AT ONOMICHI

REFERENCE ON FIGURE VI - 146	APPROXIMATE DIMENSIONS (FT.)	BERTHAGE (FT.)	DEPTH ALONGSIDE (FT.)
①	300 by 45	300+45+45	Less than 6
③	120 by 20	120+20+20	Less than 6
④	19+90 by 20	90	6 to 15
		90	15
⑤	90 by 20	90+20+20	Less than 6
⑥	120 by 20	120+20	Less than 3
		20	Less than 6
⑦	100 by 20	100+20	Less than 6

(c) Repair facilities. A 500-ton marine railway is operated by Mukaishima Dockyards. Known details of the 4 drydocks at Onomichi are listed in TABLE VI - 43.

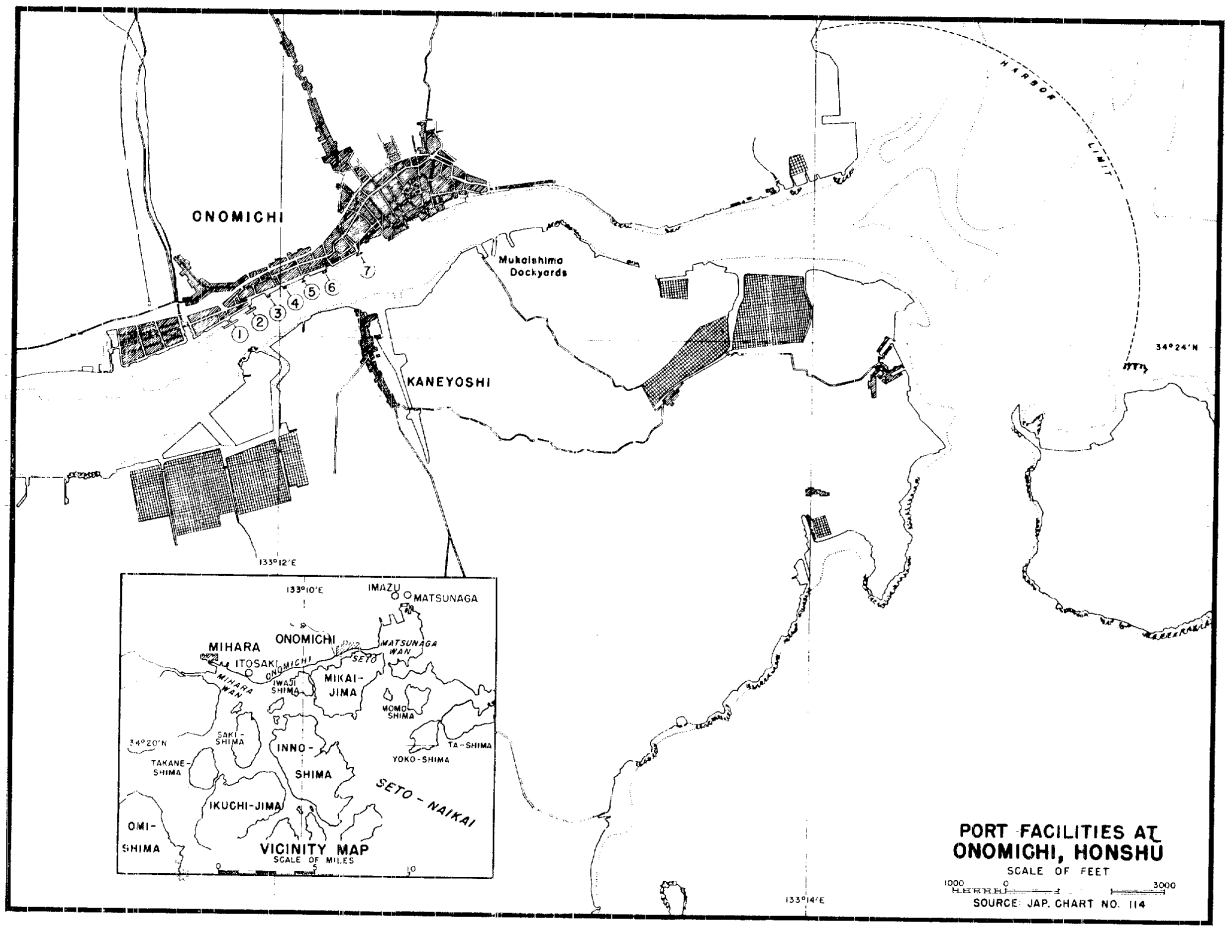

FIGURE VI - 147. *Onomichi.*
Map of harbor showing location of port facilities by encircled reference numbers.

TABLE VI - 43

DRYDOCKS AT ONOMICHI

OWNED AND OPERATED BY	MUKAISHIMA DOCKYARDS	MUKAISHIMA DOCKYARDS	ONOMICHI DOCKYARDS	MATSUBA IRON WORKS
Location on waterfront	Opposite shore E end of town	Opposite shore E end of town	E end of town	Unknown
Type	*Graving*	*Graving*	*Graving*	*Graving*
Entrance; Width (feet)				
At coping	42.5	55.0	42.5	27.7
6 feet above sill	40.5	52.0	40.7	No data
Length (feet)				
Over all	295.0	410.0	290.0	163.0
On bottom	290.0	405.0	283.0	162.5
Depth on sill, M.H.W. (feet)	18.0	19.5	18.0	9.0
Mean rise of tide above datum of soundings	6.9	6.9	6.9	6.9
Crane service	No data	No data	No data	No data
Remarks:	Stone dock closed by wood caisson	Stone	Stone and concrete dock closed by wood caisson	Dock cut in rock and closed by pontoon

(13) Hibi (34° 27′ N, 133° 56′ E).

Hibi is on the south coast of Honshū at a midpoint of the Inland Sea. The town is an important center for the production and shipping of salt. Uno, Toma (63, B, (14)), and Hibi are often considered ports of the city of Tomano. Anchorage is available, but the depths at landing facilities are shallow.

(a) Harbor. The harbor consists of Hibi-kō, a recession in the shoreline facing southward, about 800 yards wide with a depth of 2 fathoms at the harbor entrance (FIGURE VI - 148). At the latter point the bottom drops off steeply to 7 fathoms toward the approaches but rises gradually to the northward for about 800 yards to the zero tide line at the head of the harbor. On the eastern side of the recession is a basin, formed by 2 breakwaters, that dries at low tide. The town of Hibi lies on the west side; the town of Mukōhibi on the east side behind the basin; extensive salt pans occupy an area at the north end of the harbor. Submerged rocky shoals border the shore at the north end of the east side, and the shores on both sides of the entrance. Aside from these obstructions the entrance and approach are free of hidden dangers.

Small craft can anchor in the harbor, where some protection is offered, in depths of 1 to 2 fathoms over mud. About 30 first-class fair weather berths, clear of submarine cables, are available for anchorage in the open water area outside the harbor, between the mainland and Ozuchi-shima, in depths of 7 to 26 fathoms over sand and shells.

(b) Landing facilities. The port has a quay in front of town with its face inside the 1-fathom contour; and a small mole at the south end, with charted depths of 6 to 9 feet along the north side. A number of buildings that might be used as warehouses are shown on the pier. A motor highway extends from Hibi to nearby inland towns where connection is made with the highway and railroad nets of Honshū. Known details of wharf facilities are listed in TABLE VI - 44.

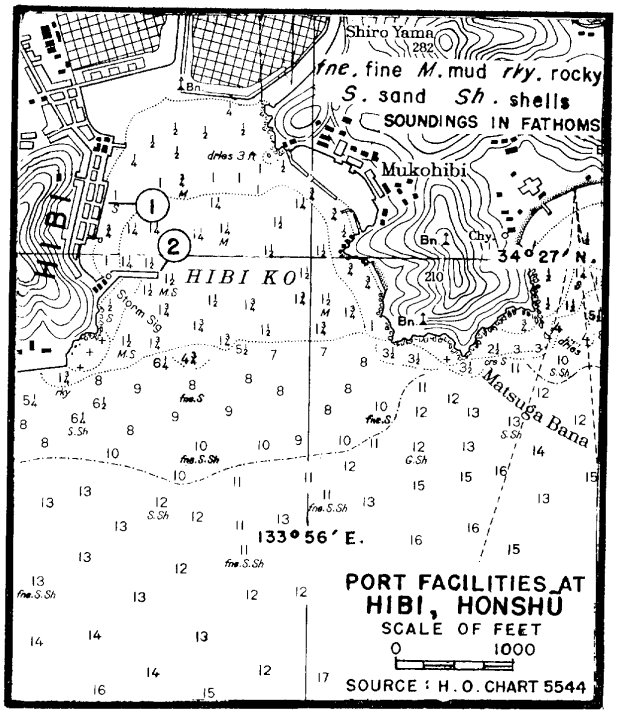

FIGURE VI - 148. *Hibi.*
Map of harbor showing location of port facilities by encircled reference numbers.

(14) Uno (34° 28′ N, 133° 57′ E).

Uno is on the south coast of Honshū southward from Okagama near a midpoint of the Inland Sea. It is a shipbuilding center and military embarkation point. The passenger and cargo terminals are at Uno at the north end of the harbor; a ship-

TABLE VI - 44

PIERS, WHARVES, AND QUAYS AT HIBI

Reference on FIGURE VI - 148	①	②
NAME	QUAY	MOLE
Location on waterfront	Midpart of town	S end of town
Purpose for which used	No data	No data
Type of construction	No data	No data
Description:	Face (ft.)	N side (ft.)
Dimensions	450	375
Depth of water	Less than 6	9 to 6
Berthing space available	450	375
Width of apron	30	Open
Transit sheds	No data	None
Mechanical handling facilities	No data	No data
Railroad connection	None	None
Water supply	No data	No data
Electric current	No data	No data
Remarks	All dimensions scaled from chart; charted depths; the chart and a photograph show a number of buildings that might be used as transit sheds.	

yard takes up the Tama waterfront at the south end. Wharf facilities for medium-sized ships are available. Uno, Tama, and Hibi (63, B, (13)) are often considered ports of Tamano.

(*a*) *Harbor.* Uno-kō consists of that portion of Katsurashima-suidō adjacent to the towns of Uno and Tama (FIGURE VI - 149). The irregular shoreline is bordered in most places with a 1-fathom mud shoal of varying widths; from this shoal the bottom drops off for 50 to 300 yards farther to the 10-fathom contour. Central depths vary from 9 to 28 fathoms with no hidden dangers outside the 5½-fathom contour. The entrance from the south has a least width of 1,000 yards between the 10-fathom curves while that from the east, at the north end of the harbor, is only 600 yards wide. Other passages are somewhat narrow and tortuous.

The inner harbor has depths of 1½ to 3 fathoms, over mud bottom. Eight first-class berths are available for fair weather anchorage inside the harbor limits in depths of 9 to 28 fathoms, over coarse sand and shells.

The tide is semidiurnal and the lunitidal interval is 11 hours and 18 minutes. The spring rise is 7¾ feet and the neaps rise 6¼ feet above the datum of soundings.

(*b*) *Landing facilities.* At Uno, the improvements provide for the transfer of passengers, cargo, and railroad cars, and the embarkation of military supplies and personnel; at Tama, most of the waterfront is used exclusively by the shipyard. Improvements with railroad connections along the waterfront of Tama apparently can be converted to the handling of cargo and passengers (FIGURE VI - 150). Two wharves of the main quay (References ① ③)* are used for mooring ships end-on (FIGURE VI - 151). Work barges are used as landing floats for vessels. A mole extends out from a midpoint of the quay with mooring dolphins. This allows a small wharf space for 1 ship alongside (Reference ②) which might be a tanker mooring. The remainder of the shore of Tama is improved by a rock revetment that might be equipped with mooring facilities for the use of work boats.

An extensive seawall fronts a substantial portion of reclaimed ground on the west side of the inner harbor but there is no information to show that it can be used for landing. Two landings extend from the seawall on the north shore while 3 piers, located to the eastward, extend to depths of 6 to 12 feet. The railroad pier (Reference ⑨) was being extended for about 700 yards to the 5½-fathom contour; this was to be completed in 1941. A military embarkation pier (Reference ⑪) and a railroad car ferry landing are east of the railroad pier. The seawall east of the car ferry landing has what appears to be a boat landing (Reference ⑫). Mooring buoys are charted near the military pier at Uno and off the shipyard at Tama. Known details of wharf facilities are listed in TABLE VI - 45.

*References are encircled numbers on FIGURE VI - 149.

TABLE VI - 45

PIERS, WHARVES, AND QUAYS AT UNO

Reference on FIGURE VI - 149	①	②	③
NAME	UNKNOWN	UNKNOWN	UNKNOWN
Location	Near midpoint of Tama	Near midpoint of Tama	Midpoint of shipyard
Purpose for which used	Ship mooring	Shipyard facility	Ship mooring
Type of construction	No data	No data	No data
Description:	Face (ft.)	Face (ft.)	Face (ft.)
Length	210	75	360
Depth of water	7 to 12	16	13
Berthing space	210	300 with moorings	360
Width of apron	Open	Open	Open
Transit sheds	No data	No data	No data
Mechanical handling facilities	Locomotive crane	No data	Locomotive crane
Railroad connection	Track on face of quay	No data	Track near face of quay
Water supply	No data	No data	No data
Electric current	No data	No data	No data
Estimated terminal capacity	—	—	250
Remarks	Ships moor end-on	Vessels berth alongside dolphins	Ships moor end-on

Reference on FIGURE VI - 149	④	⑤	⑥
NAME	UNKNOWN	UNKNOWN	UNKNOWN
Location	Midpoint of shipyard	Midpoint of shipyard	N shore of Uno-kō
Purpose for which used	Boat landing; shipyard facility.	Shipyard facility; boat landing.	Boat landing
Type of construction	No data; T-head shape.	Pile construction	No data; T-head shape.

TABLE VI - 45 *Continued*

PIERS, WHARVES, AND QUAYS AT UNO

Description:	Face (ft.)	Face (ft.)	Face (ft.)
Length	75	45	55
Depth of water	12	Less than 6	Less than 6
Berthing space	75	45	55
Width of apron	Open	Open	Open
Transit sheds	No data	No data	No data
Mechanical handling facilities	Locomotive cranes	Shearlegs; locomotive cranes.	No data
Railroad connection	Track at rear of wharf	Single track dead-ends at face of pier	No data
Water supply	No data	No data	Water available

Reference on FIGURE VI - 149	⑦			⑧			⑨		
NAME	UNKNOWN			UNKNOWN			RAILROAD PIER		
Location	Waterfront of Uno			Waterfront of Uno			Waterfront of Uno		
Purpose for which used	Ferry landings			No data			General cargo		
Type of construction	Floating wood pontoons			No data			Apparently stone seawall with dirt fill		
Description:	Face (ft.)	W side (ft.)	E side (ft.)	Face (ft.)	W side (ft.)	E side (ft.)	Face (ft.)	W side (ft.)	E side (ft.)
Length	50	100	100	30	180	180	250	500	75 + 60 + 200
Depth of water	12	9	12	12	12	12	7	7 to 9	6 to 7
Berthing space	50	100	100	30	180	180	—	450	75 + 60 + 150
Width of apron	Open			Open					
Transit sheds	No data			No data					
Mechanical handling facilities	No data			No data					
Railroad connections	None			None			Tracks on pier		
Water supply	No data			Fresh water available			Fresh water available		
Remarks	—			—			Extension to pier was to have been completed in 1941		

Reference FIGURE VI - 149	⑩	⑪			⑫
NAME	UNKNOWN	MILITARY PIER			UNKNOWN
Location	Basin of railroad pier	E of railroad pier			E of military pier
Purpose for which used	General cargo	General cargo			No data
Type of construction	No data	No data			No data
Description:	Face (ft.)	Face (ft.)	W side (ft.)	E side (ft.)	Face (ft.)
Length	80	75	75 + 50 + 125	175	75
Depth of water	7	6	6 to 7	6	7
Berthing space	80	75	75 + 50 + 125	175	75
Width of apron	Open	Open			Open
Transit sheds	No data	No data			No data
Mechanical handling facilities	No data	No data			No data
Railroad connections	Tracks near face of wharf	Tracks on face of wharf			No data
Water supply	Fresh water available	Fresh water available			Fresh water available

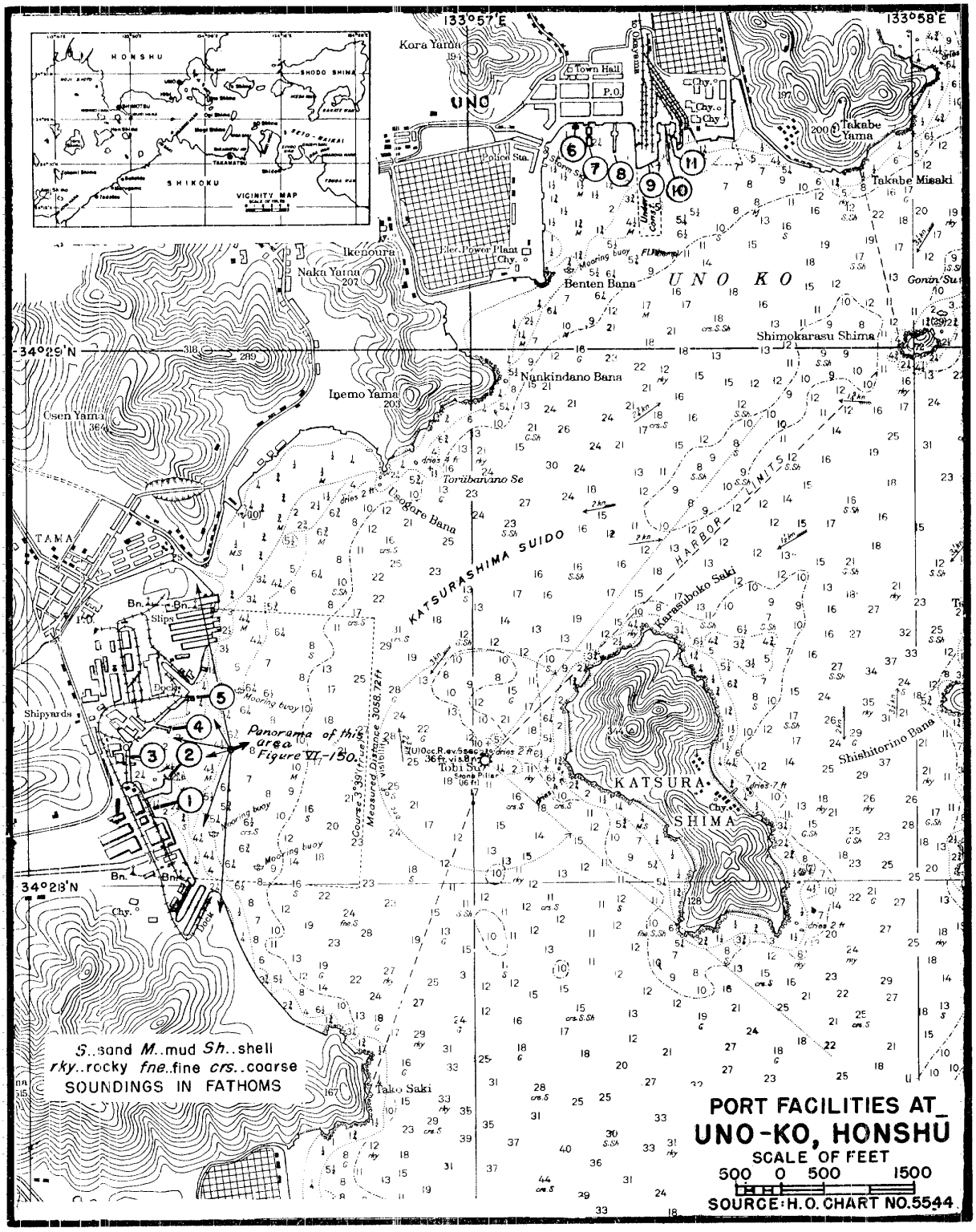

FIGURE VI - 149. *Uno.*
Map of harbor showing location of port facilities by encircled reference numbers.

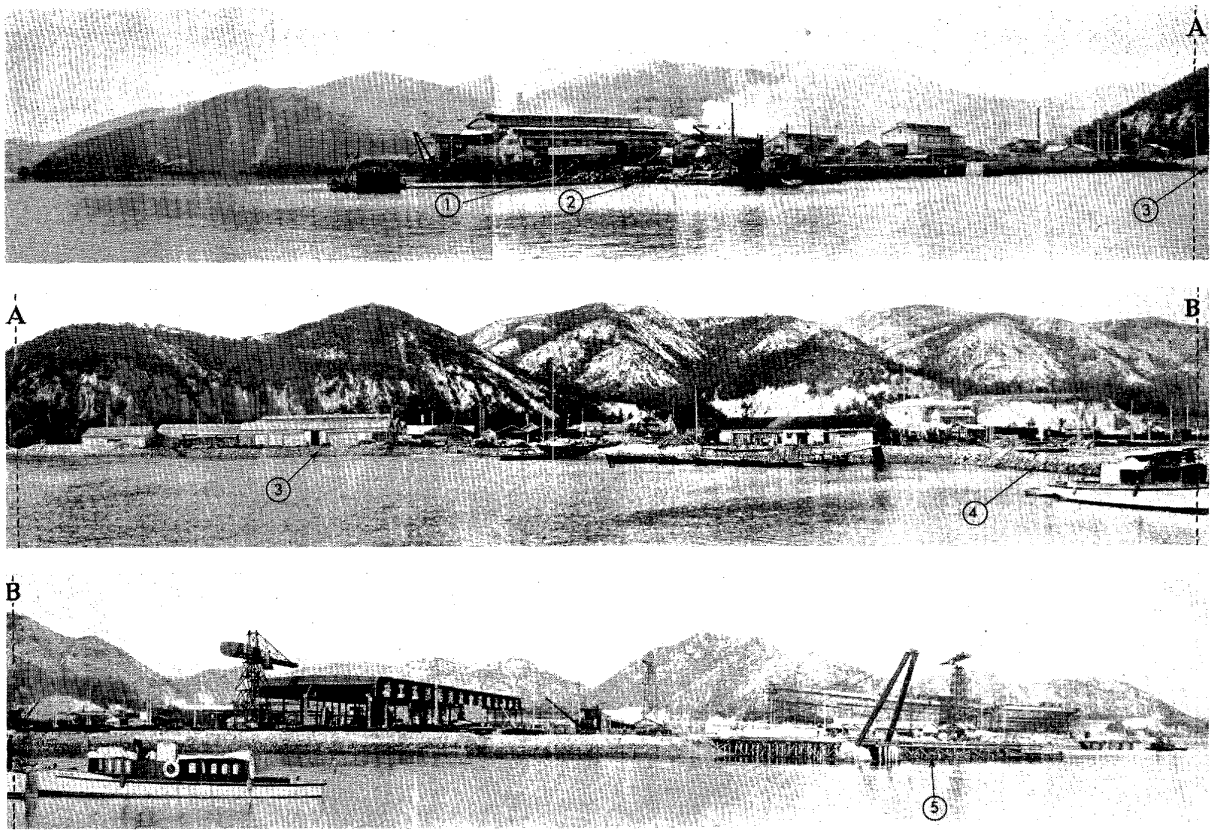

FIGURE VI - 150. *Uno.*
Panorama of Tama shipyard. Encircled numbers are references to FIGURE VI - 149. 3 December 1919.

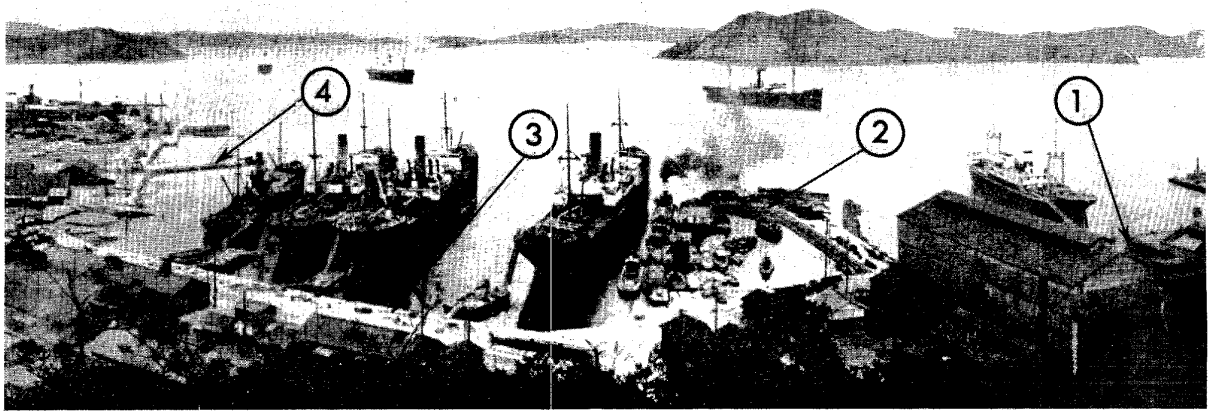

FIGURE VI - 151. *Uno.*
Tama shipyard quays and pier (References ① ② ③ ④), looking east-northeastward. Prior to 1933.

Several single-story, reinforced concrete military warehouses are located adjacent to the rear of the piers. There is a 70-ton floating crane based at the shipyard at Tama. The shipyard and the cargo and passenger piers at Uno are served by railroad tracks. A railroad car ferry and a passenger ferry were in service to Takamatsu, on Shikoku. The town was a port of call for inter-island steamers.

(*c*) *Supplies.* Water of good quality can be supplied at the rate of 40 tons per hour. The shipyard has 6 Diesel oil tanks, 90 feet by 35 feet, in the southwest corner of the yard, connected by pipe line with a tanker mooring. The capacity of this tankage is about 269,100 barrels.

(*d*) *Repair facilities.* The shipyard has complete engine and hull fabricating plants which can be used for the repair and rebuilding of any type of ship machinery or medium-sized hull. Crane service is extensive. Three graving drydocks, cut from solid rock, are listed in TABLE VI - 46.

TABLE VI - 46

DRY DOCKS

NAME	TAMA DOCKYARD NO. 1	TAMA DOCKYARD NO. 3	TAMA DOCKYARD NO. 2
Location on waterfront	S end shipyard	S end shipyard	N end shipyard
Type and construction	Graving; stone.	Graving; stone.	Graving; stone.
Entrance:			
Width (ft.)			
At top of coping 6 feet above sill	74.1	74.1	48.8
Length (ft.):			
Top	564.6	487.5	405.0
Bottom	561.0	483.9	394.0
Depth on sill, high water springs (ft.)	22	24	14.5
High water springs (ft.)	7.8	7.8	7.8
Crane service	One rotating tower crane with a 125-ft. radius operates between docks No. 1 and No. 2.		Locomotive cranes available
Remarks	Can dock 1 vessel 480′ between perpendiculars	Can dock 1 vessel 450′ between perpendiculars	Can dock 1 vessel 330′ between perpendiculars

(15) Ō (34° 47′ N, 134° 28′ E).

Ō, on the south side of Honshū near the eastern end of the Inland Sea, is a fishing port and a shipbuilding and repair center.

(a) Harbor. The harbor, Ō-kō, is about 1,500 feet across its mouth where it merges with Ō-wan, and extends about ½ mile northward to its head at the town of Ō, where it merges with a narrow channel leading to a shallow basin (FIGURE VI - 152). It has a minimum width of 250 yards at its midpoint and depths ranging from 2½ to 4 fathoms. A basin in front of town is 100 yards wide and 200 yards long in an east – west direction and has a minimum depth of 1¼ fathoms. The waterfront of the shipyard and the town apparently was built on reclaimed ground. Practically all the remaining shoreline is rocky and rises steeply behind narrow mud and shell shoals.

The entrance to Ō-kō is through Ō-wan, which has a minimum width of 700 yards and extends southward a distance of about 4,000 yards. Depths vary from 3½ to 4½ fathoms. The only hidden danger is a rocky island and shoal at a midpoint on the eastern side.

After allowing for an adequate fairway, there are 20 third-class berths available for anchorage in Ō-wan in depths of 3½ to 4 fathoms over mud and shells. Protection is offered from all but strong southerly winds.

The tide is semidiurnal. The mean lunitidal interval is 10 hours 10 minutes. The spring high water rise is 5¾ feet and neaps 4½ feet above datum of soundings.

(b) Landing facilities. The chart shows about 3,350 feet of improved waterpront that appears to be quayed seawalls, fronted by a fender piling that might be available as fitting-out wharf spaces at the shipyard. One revolving-jib crane is in use.

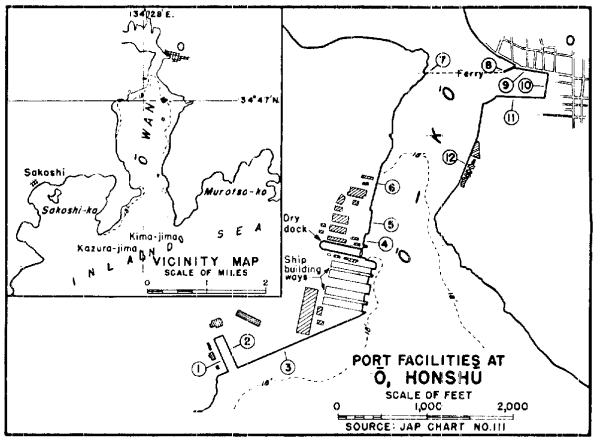

FIGURE VI - 152. Ō.
Sketch of harbor showing location of port facilities by encircled reference numbers.

A ferry landing is on either side at the head of the harbor. About 2,900 linear feet of improved waterfront in town that could probably be used as wharf space appeared to be available with buildings adjacent which might be used as warehouses. Of this amount 680 linear feet are assumed to be quayed. A road extends northerly for 1½ miles to a point near Kuga, where connection is made with the paved highway network of Honshū.

Ō-kō is a secret port of Japan and details are meager. Known or assumed details of wharf facilities are listed in TABLE VI - 47. (All dimensions are scaled from and all depths are taken from the chart).

TABLE VI - 47

PIERS, WHARVES, AND QUAYS AT Ō

Reference on FIGURE VI - 152	①	②	③
NAME	UNKNOWN	UNKNOWN	UNKNOWN
Location	W side basin	E side basin	S front of shipyard
Purpose for which used	Shipyard facility	Shipyard facility	Shipyard facility
Type of construction	Apparently stone fronted by fender piling	Apparently stone fronted by fender piling	Apparently stone fronted by fender piling
Description:	Face (ft.)	Face (ft.)	Face (ft.)
Length	400	400	1,600
Depth of water	11 to 14	11 to 14	4.3 to 16.5
Berthing space	400	400	1,600
Width of apron	Open	Open	Open
Railroad connection	None	None	None
Estimated terminal capacity	250	250	500
Remarks	One 200-ft. vessel drawing 12′ can be berthed	One 200-ft. vessel drawing 12′ can be berthed	Two 200-ft. vessels drawing 12′ can be berthed

Reference on FIGURE VI - 152	④	⑤	⑥
NAME	UNKNOWN	UNKNOWN	UNKNOWN
Location	N of dry dock	N of dry dock	N of dry dock
Purpose for which used	Shipyard facility	Shipyard facility	Shipyard facility
Type of construction	Apparently stone fronted by fender piling	Apparently stone fronted by fender piling	Apparently stone fronted by fender piling
Description:	Face (ft.)	Face (ft.)	Face (ft.)
Length	140	260	550
Depth of water	15	16½ to 19	20 to 24
Berthing space	140	260	550
Width of apron	Open	Open	Open
Mechanical handling facilities	No data	One large revolving jib crane	No data
Railway connection	None	None	None
Estimated terminal capacity	—	250	600
Remarks	—	One 250-ft. vessel drawing 16′ can be berthed	One 450-ft. vessel drawing 20′ can be berthed

Reference on FIGURE VI - 152	⑦	⑧			⑨
NAME	W FERRY LANDING	E FERRY LANDING			UNKNOWN
Location	N end of harbor	N end of harbor			In front of town
Purpose for which used	Ferry landing	Ferry landing			General use
Type of construction	No data	No data			No data
Description (1):	Face (ft.)	Face (ft.)	N side (ft.)	S side (ft.)	Face (ft.)
Length	20	20	120	120	400
Depth of water	14	7½	10½	10½	7 to 8
Berthing space	20	20	No data	No data	400
Width of apron	Open	Open			20
Transit sheds	No data	No data			Buildings on wharf—use indeterminate.
Railway connection	None	None			None

TABLE VI - 47 *Continued*

PIERS, WHARVES, AND QUAYS AT Ō

Reference on FIGURE VI - 152	⑩	⑪	⑫
NAME	UNKNOWN	UNKNOWN	UNKNOWN
Location	On city basin E end	On city basin S side	E shore, N end of harbor.
Purpose for which used	No data	No data	No data
Type of construction	No data	No data	No data
Description:	Face (ft.)	Face (ft.)	Face (ft.)
Length	280	560	390 + 600 + 420
Depth of water	7	7	11 to 13
Berthing space	No data	No data	No data
Width of apron	60	25	0 to 15 and open
Transit sheds	Buildings adjacent—use indeterminate.	Buildings adjacent—use indeterminate.	Buildings adjacent—use indeterminate.
Railway connection	None	None	None

(*c*) *Repair facilities.* The Harima Dockyard owned and operated by the Kōbe Steel Works, has building ways and 1 drydock on the western side of Ō-kō and another is reported planned. The amount of shop facilities are unknown because at one time all machinery for vessels built at the yard were supplied by the factory at Kōbe. It is believed, however, that equipment has been installed for building some engines here. A heavy crane is available. The drydock is described as follows:

Name	Harima Drydock
Owned by and operated by	Kōbe Steel Works
Location on water front	W side of harbor
Type	Graving; stone.
Entrance	
Width at coping	75.6 feet
Width 5 feet above sill	71.6 feet
Body of dock	
Length, coping head to side of caisson (feet)	518
Length on bottom (feet)	510
Depth on keel blocks, M.H.W. (feet)	20
Mean rise and fall of tide (feet)	6.6

(16) Shimotsu (34° 06′ N, 135° 09′ E).

Shimotsu is on the eastern side of the Kii-suidō on the southwestern coast of Honshū.

(*a*) *Harbor.* Shimotsu-kō lies at the head of Ōsaki-wan, a bay indenting the coast for about 1.5 miles with an average width of about ½ mile (FIGURE VI - 153). The harbor is divided into 2 parts by a narrow promontory that terminates in Ushiga-kubi. The eastern arm, the larger part, is the principal harbor and is about ½ mile long and ¼ mile wide, with depths at the entrance of about 6 fathoms, decreasing to 3¼ fathoms near the head. It provides shelter from all winds and seas and is considered one of the good anchorages of the Kii coast.

The entrance is through Ōsaki-wan, and is about ¾ mile wide between Metori-hana and Aoishi-hana, the southern and northern entrance points respectively. The entrance to Shimotsu-ko, between Ushiga-kubi and the point northward of the wharf, is about ¼ mile wide. The shores of the outer bay are in general free and clear of all obstructions.

Temporary anchorage, sheltered from westerly winds, can be found in the bight of the eastern side of Jino-shima, outside the bay, in depths of 6½ to 8 fathoms, mud bottom. Anchorage may be found in Ōsaki-ura in depths of about 8 fathoms, mud bottom, protected from all but westerly winds, but it is reported that seas enter Ōsaki-ura with strong southerly winds. Protected anchorage is found in Shimotsu-kō in depths of 3¼ to 6 fathoms, mud bottom. There are probably 2 second-class anchorages in Shimotsu-kō and 3 first-class or 4 second-class anchorages in Ōsaki-ura.

The lunitidal interval at Ōsaki-wan is 6 hours 24 minutes; springs rise 6 feet, neaps 4¼ feet, and the mean tide level is 3½ feet. The flood tide flows northward and the ebb southward along the coast with velocities of 1 and 2 knots respectively.

(*b*) *Landing facilities.* A quay, about 580 feet long with depths of 22 to 26 feet alongside for about 430 feet of its length, is on the eastern shore of the harbor. This wharf is owned and operated by Doi Petroleum Company. Details of its construction are unknown but it is probably a substantial wharf. The town waterfront on the southern side of the harbor has a quay or seawall which extends about 600 feet along the shore. The depths alongside are shallow, probably about 6 feet. There are several sheds or warehouses shown on the oil company wharf but data regarding them are not available. It is believed that pipe lines are laid on the oil wharf. There are no railroad connections at either quay.

The waterfront of the village of Nishinoura, at the head of the western arm of Shimotsu-kō, has several small wharves with depths of about 6 feet alongside. There are also probable landing places in the northern arm of Ōsaki-wan, where there appears to be shore wharves or quays on the eastern side, with depths alongside ranging from 18 to 30 feet.

(*c*) *Storage facilities.* On the oil wharf there are 4 small sheds or warehouses, each about 75 by 30 feet, or a total of about 8,900 square feet of floor space. A building about 100 by 50 is located on the town wharf. A large portion of the town wharf and an area of some size adjacent to the railroad station probably

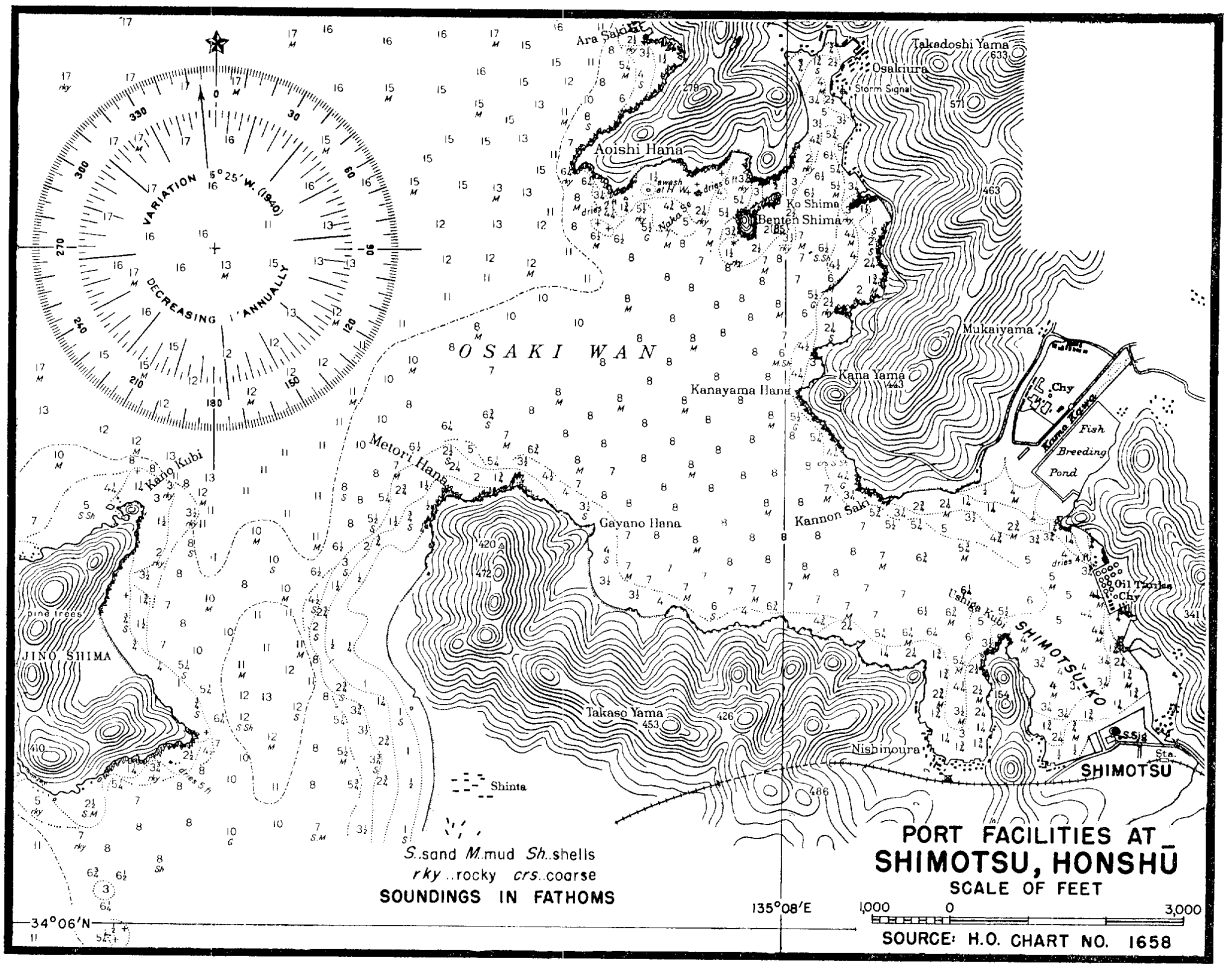

FIGURE VI - 153. *Shimotsu.*
Map of harbor.

are available for open storage. Both are served by roads and the latter by railroad.

(*d*) *Clearance facilities.* Roads lead from the town wharf to the town and highway system. The railroad station is located about 200 yards southward from the town wharf. This line is a part of the Kisei Seisen and serves the coastal region.

(*e*) *Supplies.* It is reported that water is available on the oil wharf, except in winter. The oil wharf has a number of oil tanks on and at the rear of the wharf; 15 tanks are reported. These tanks are owned by The Doi Petroleum Company. Ships are bunkered from a floating pipe line.

(17) Taketoyo (34° 51′ N, 136° 56′ E).

Taketoyo is on the western side of Chita-wan, an arm of Ise-wan, on the southern coast of Honshū.

(*a*) *Harbor.* An artificial harbor consists of a basin formed by a breakwater and a pier, with 2 small piers southward of the basin, and waterfront improvements to the north of the basin. The enclosed harbor, about 2,000 yards long, 175 yards wide, dries during low water.

Taketoyo is 9 miles northward of Morosaki-suidō, the entrance to Chita-wan, which is between Hazu-saki, the southern extremity of Chita-hantō, and the islands eastward and southeastward. The southern part of Chita-wan is about 2 miles wide between the 3-fathom contour, widens to about 4 miles midway to Taketoyo, and then narrows again to about 1 mile wide at the town. The depths decrease from about 10 fathoms in the southern part to 4 fathoms at Taketoyo. The bay is fronted by shallow banks on its eastern side, but is comparatively deep on its western side.

The entrance to the enclosed harbor at Taketoyo, about 125 yards wide, is shoal and encumbered with seaweeds.

There is anchorage off Taketoyo with the pier bearing 266°, about 1,500 yards distant, in about 5 fathoms. Vessels over 15 feet draft should not go farther up than this. Small vessels might anchor nearer the pier according to draft, or go farther up the bay, but eastward of Handa the depths decrease to about 9 feet. Chita-wan affords ample room, in depths of 4 to 8 fathoms, mud bottom, to accommodate an entire fleet.

The mean high water interval at Saku-shima, the entrance to Chita-wan, is 6 hours, 6 minutes. The spring range of tide is 5.4 feet, and the mean range 3.9 feet. The flood current sets northward with a velocity of ½ knot, and the ebb current southward at about 1 knot.

(*b*) *Landing facilities.* The pier forming the southern side of the enclosed harbor is about 1,500 feet long, with less

than 18 feet of water at its head. Two piers south of the enclosed harbor, about 200 and 400 feet long, dry during low water.

Lighters are available. Two railroads pass through Taketoyo, one of which serves the pier. Taketoyo is on the highway, which extends the length of the Chita-hantō. Two other improved roads lead to the western side of the peninsula.

(*c*) *Supplies.* Bunker oil and kerosene are discharged at Taketoyo through a floating 6-inch pipeline from tankers which anchor about 1,500 feet from the pier. The average rate of discharge is about 700 barrels per hour. No bunkering facilities or tank barges are available, but lighters were available for packed cargo. Case oil must be discharged by lighters, the usual rate of which is about 300 cases per hatch per hour. There are 2 oil tanks, one of which is stone.

(*d*) *Repair facilities.* There is a drydock at Koromogama Shipyard, 250 feet long, 42 feet wide, and 12½ feet deep on the sill during high water. The exact location of this drydock is not known.

C. Other landings.

There are 36 other landings around the coast of Southwest Honshū. Significant information on each is listed in TABLE VI - 48.

TABLE VI - 48

OTHER LANDINGS ON SOUTHWESTERN HONSHŪ

NAME	COORDINATES N	COORDINATES E	ENTRANCE CHANNEL WIDTH (FT.)	ENTRANCE CHANNEL DEPTH (FT.)	HARBOR DEPTH (FT.)	LANDING FACILITIES NUMBER AND TYPE	LANDING FACILITIES DEPTH ALONGSIDE (FT.)	REMARKS
1. Obama—Nishizu	35°30′	135°45′	1½ mi.	102 to 120	6 to 60	Quays	8 to 11½	Artificial fishing harbor
2. Iwaga-hana	35°39′	135°16′	Open	60	18	1 pier	7.2	Wooden pier on open coast
3. Tsuiyama	35°39′	134°50′	1600	48 to 72	30	Wharves	6 to 15	Small basin at river mouth
4. Kasumi	35°38′	134°37′	No data	No data	9 to 13½	Wharf	9	Artificial fishing harbor
5. Yasugi	35°25′	133°15′	300	13.5 to 24	9.8 to 16	1 wharf	No data	Inland port reached through Sakai channel
6. Yonago	35°25′	133°20′	300	13.5 to 24	7.5 to 15	No data	No data	Harbor works in progress (1939)
7. Nago	34°30′	131°28′	No data	No data	0 to 6	No data	No data	Small shallow cove with 700′ breakwater
8. Oura	34°24′	130°58′	2100	120	48 to 84	1 landing	6	Natural protection
9. Futaoi-jima	34°06′	130°47′	No data	No data	No data	1 pier	No data	Anchorage
10. Yasuoka	34°02′	130°54′	Open	30	1 to 10	No data	No data	2 small breakwaters on piers
11. Nishinoura	34°00′	131°33′	2 miles	30	12 to 30	1 pier	No data	—
12. Mitajiri	34°02′	131°35′	3000	27	6 to 24	1 pier	1 to 6	Possible landings at pier or mole L-head.
13. Murozumi	33°55′	131°58′	1575	31½	9 to 39	1 pier	6	—
14. Obatake	33°57′	132°10′	900	No data	No data	1 pier	Dry at l. w.	Artificial basin and small craft anchorage.
15. Itsukushima, Itsuku-shima	34°17′	132°19′	600	22	No data	2 piers	No data	—
16. Kinoe, Osaki-kami-shima	34°14′	133°55′	1350	34½ to 60	Dries	Piers Landings	No data No data	2 graving docks 110′ and 112′ long, 1 marine railway 370 tons and light 300-ton railways.
17. Tomo	34°23′	133°23′	250	30 to 48	12 to 60	2 landings Quay Quay	No data 1.3 to 5.9 11.5	In Tomo old basin In Tomo old basin New port work in progress (1937)
18. Kasaoka	34°30′	133°30′	2 mi.	30 to 60	8.2 to 30	1 pier 1 landing	No data No data	Protected by breakwater; port also has a small basin.
19. Tonosho, Shodo-shima	34°29′	134°10′	No data	No data	3 to 7½	1 pier 1 landing	No data 6	—
20. Shikama	34°47′	134°40′	285	7.5 to 20	7 to 20	No data	No data	Artificial harbor at river mouth; harbor works in progress.
21. Sakai	34°35′	135°28′	115	9.2	13.8	No data	No data	Harbor works in progress (1940)
22. Ōtsu	34°30′	135°24′	450	No data	18	3 wharves	7	Artificial harbor
23. Kishiwada	34°28′	135°22′	No data	No data	No data	1 breakwater 1 quay	12 9	Artificial harbor
24. Kada	34°16′	135°04′	Open	30	21 to 27	1 pier	No data	Small boat anchorage
25. Wakanoura-Shiotsu	34°11′	135°10′	3 mi	42 to 60	18 to 48	1 pier 1 pier	No data No data	At Waka village At Shiotsu village
26. Shiotsu	34°08′	135°10′	No data	72 to 96	19½ to 26	1 pier	No data	—
27. Yura	33°58′	135°07′	No data	No data	49 to 63	1 pier	12	—

166	(1902)	191	(1925)	202	(1925)
170	(1927)	192	(1930)	217	(1931)
171	(1933)	193	(1929)	223	(1901)
174	(1930)	197	(1930)	259	(—)
188	(1930)	201	(1931)	1053	(1938)
1102	(1926)	1218	(1929)		
1103	(1934)	1224	(1931)		
1175	(1936)	1226	(1933)		
1176	(1935)	1228	(1929)		
1177	(1936)	1230	(1931)		

48. U. S. War Department, Army Map Service.
AMS L403 Sheets:
1940 No. 23; 1941. No. 2.
AMS L571 Sheets:
1943. No. 50.
1944. Nos. 24, 26, 27, 34, 36, 37, 38, 39, 44, 45, 46, 47, 48, 49, 56.

49. U. S. War Department, Office Chief of Engineers, Technical Intelligence Branch.
Miscellaneous Map of Osaka.
Map of Inland Sea.

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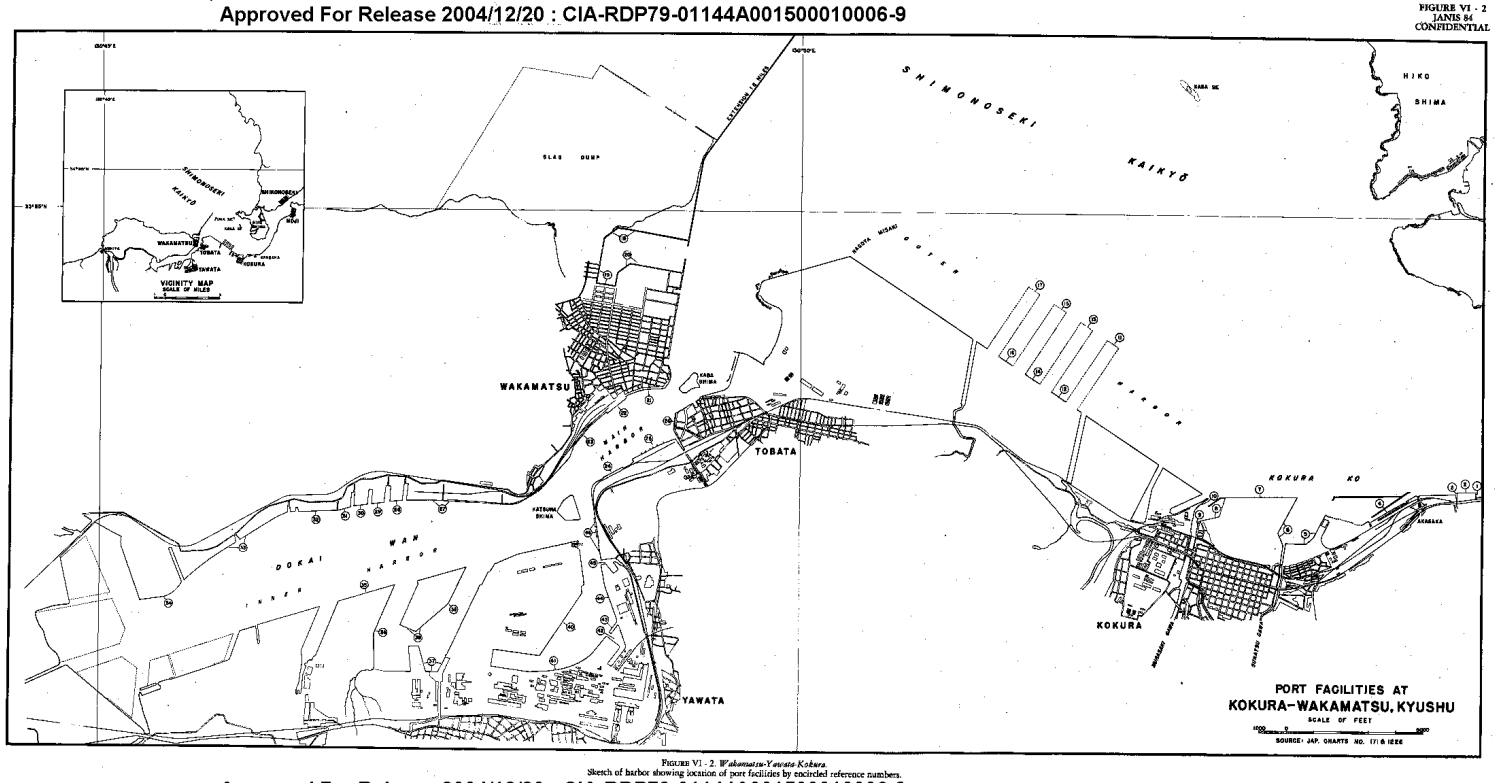

FIGURE VI - 2. *Wakamatsu-Yawata-Kokura*
Sketch of harbor showing location of port facilities by encircled reference numbers.

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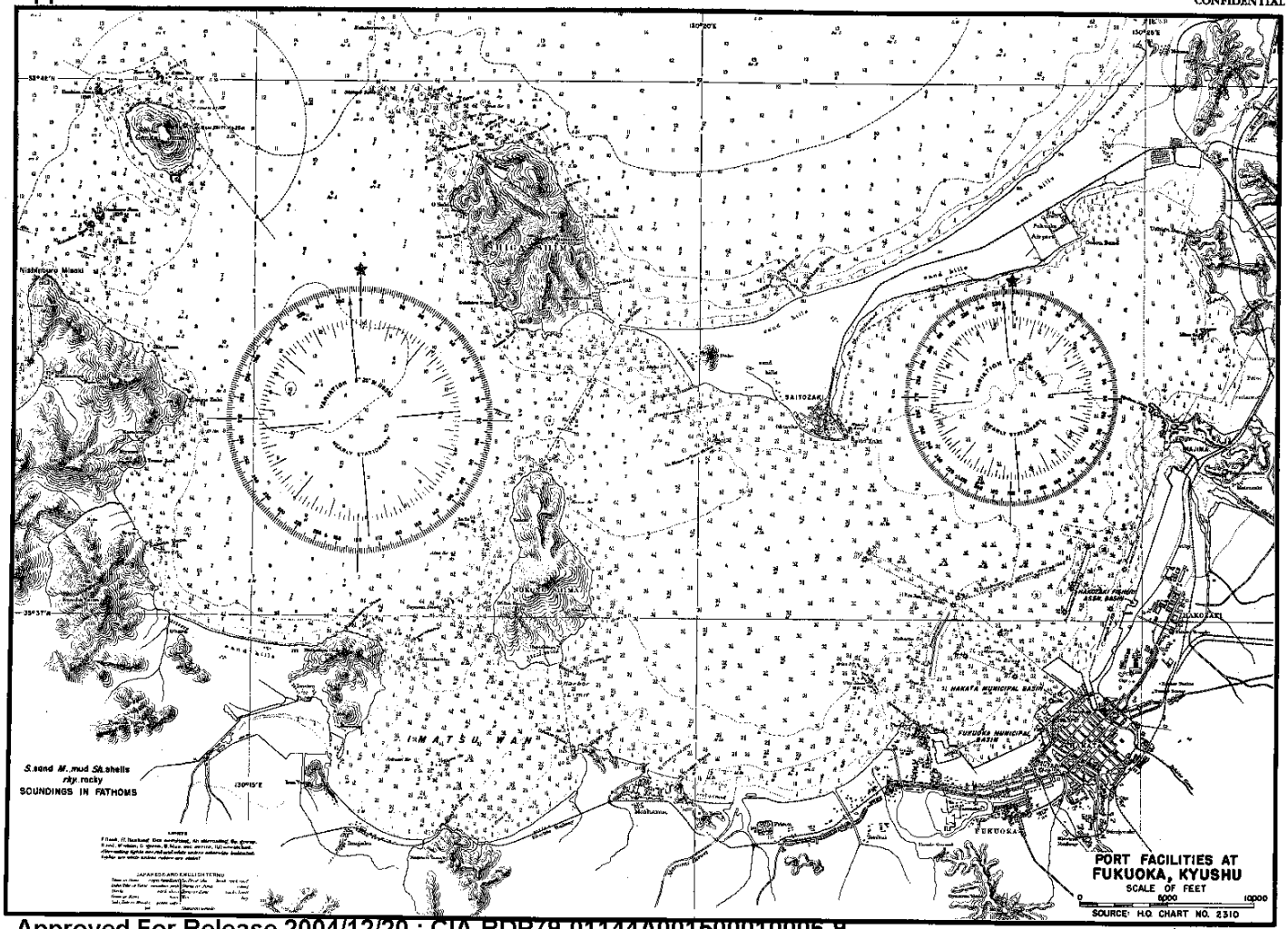

Map of harbor showing location of port facilities.

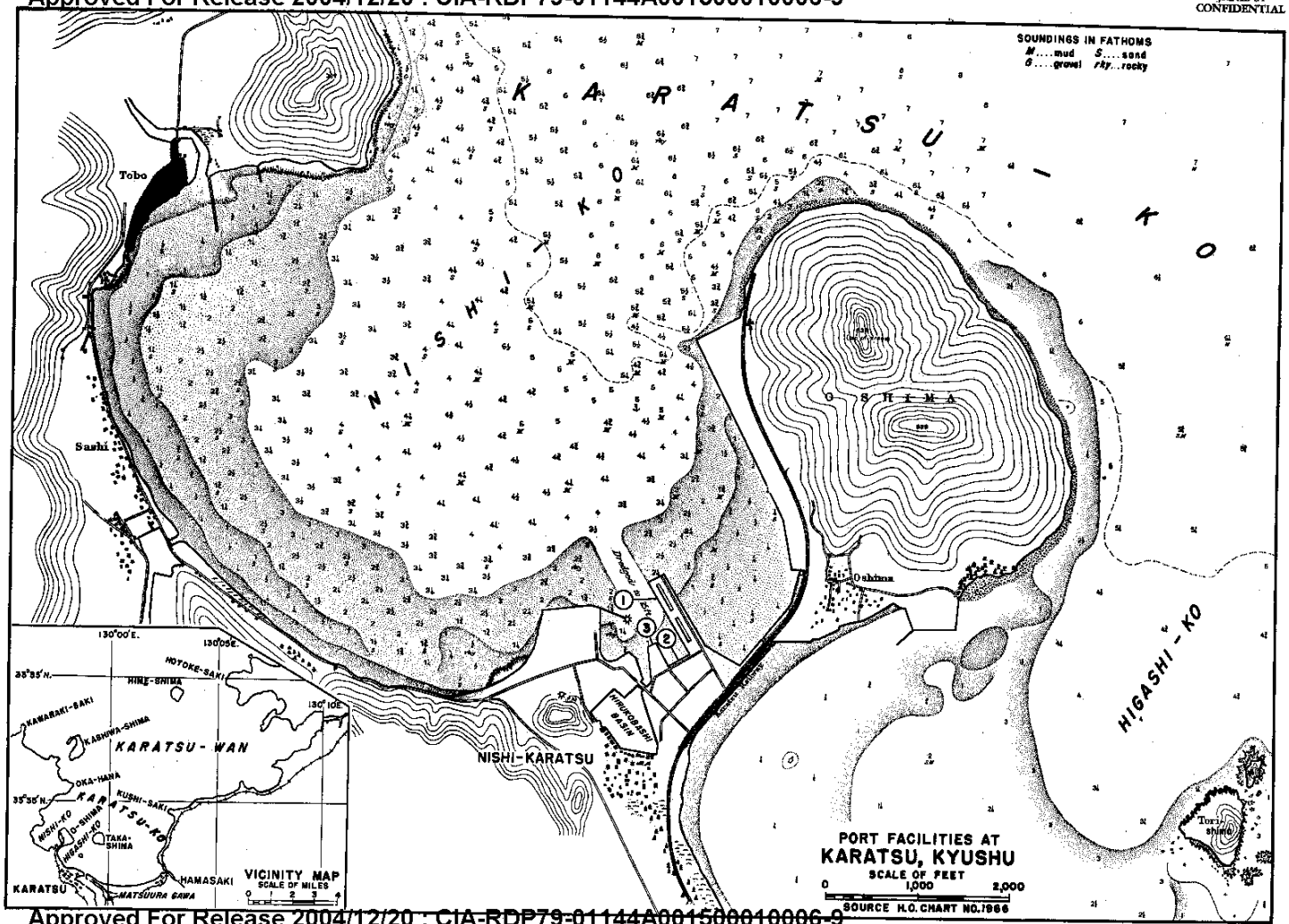

FIGURE VI - 12. *Karatsu.*
Map of harbor showing location of port facilities by encircled reference numbers.

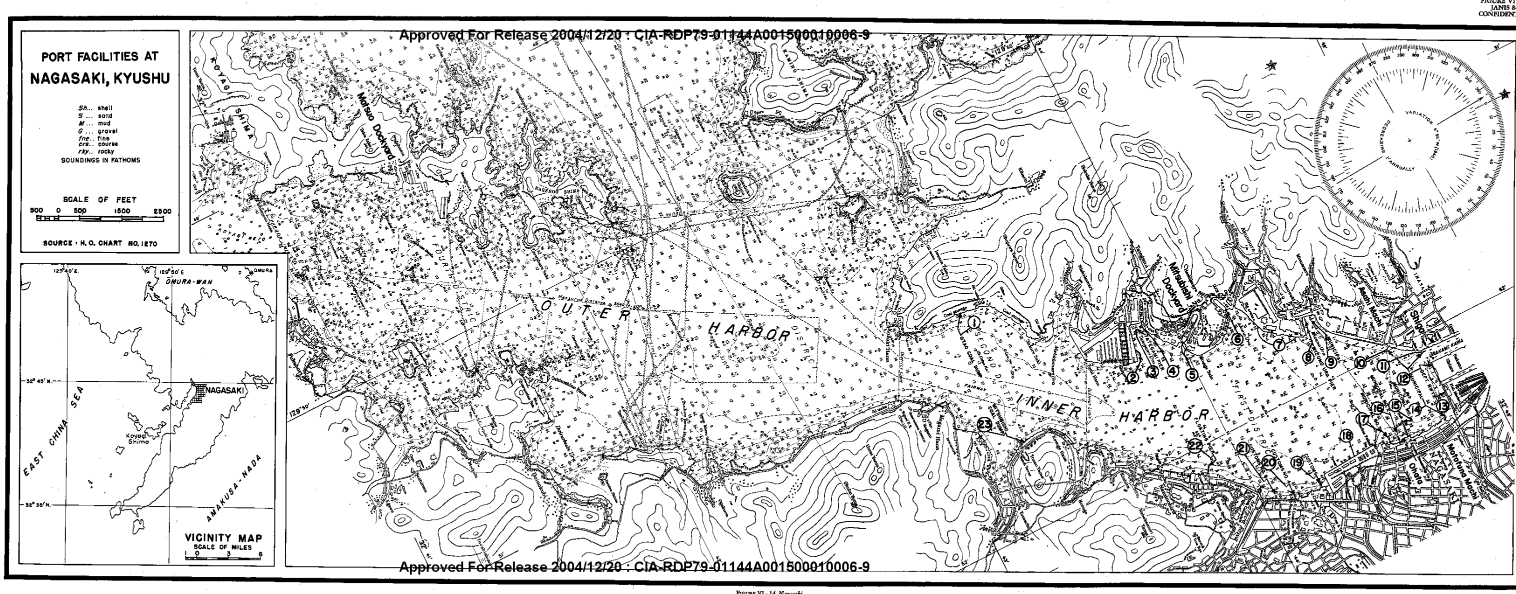

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FIGURE VI - 14. *Nagasaki.*
Map of harbor showing location of port facilities by encircled reference numbers.

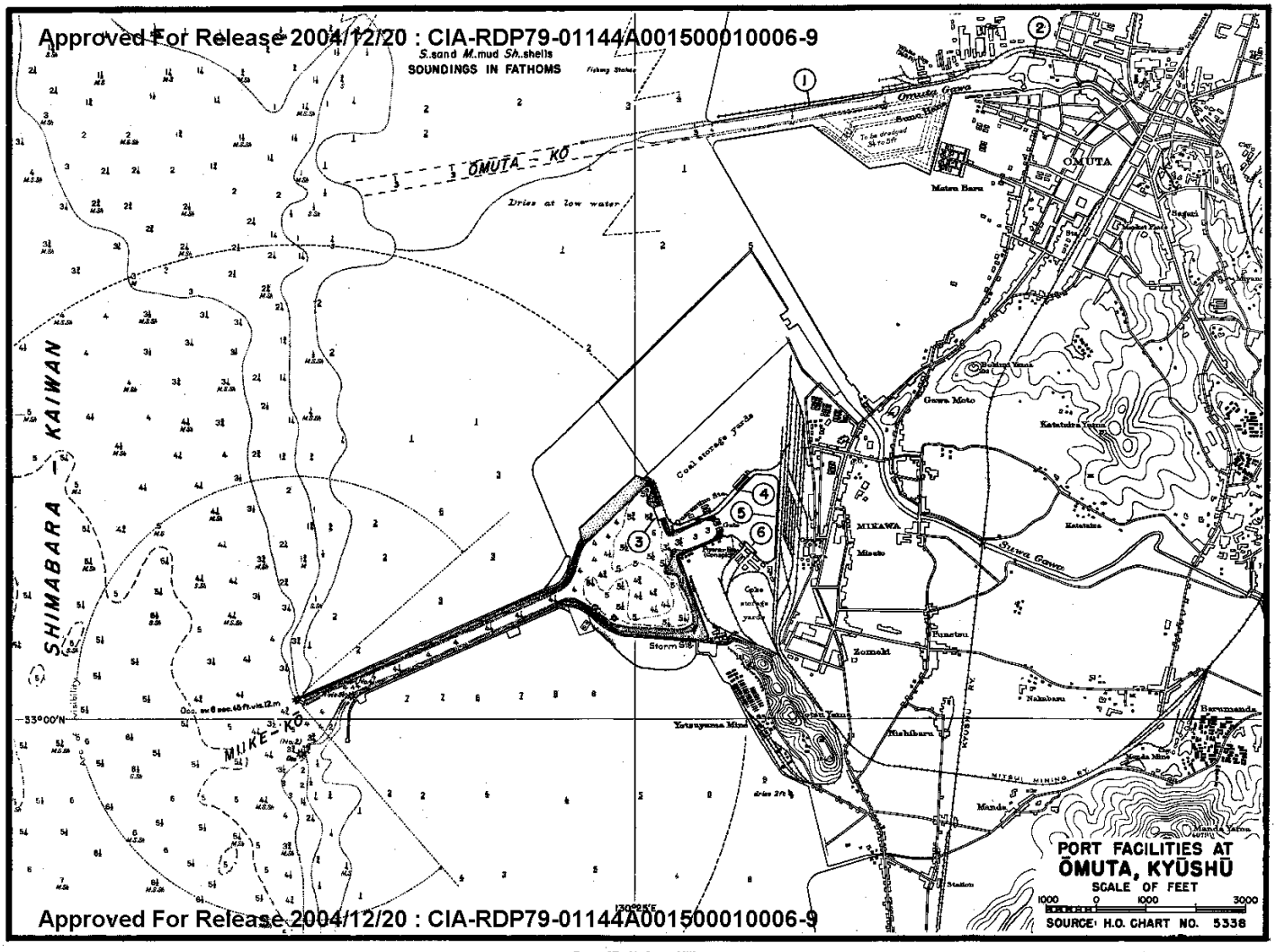

FIGURE VI - 23. *Omuta-Miike.*
Map of harbors showing location of port facilities by encircled reference numbers.

FIGURE VI - 29
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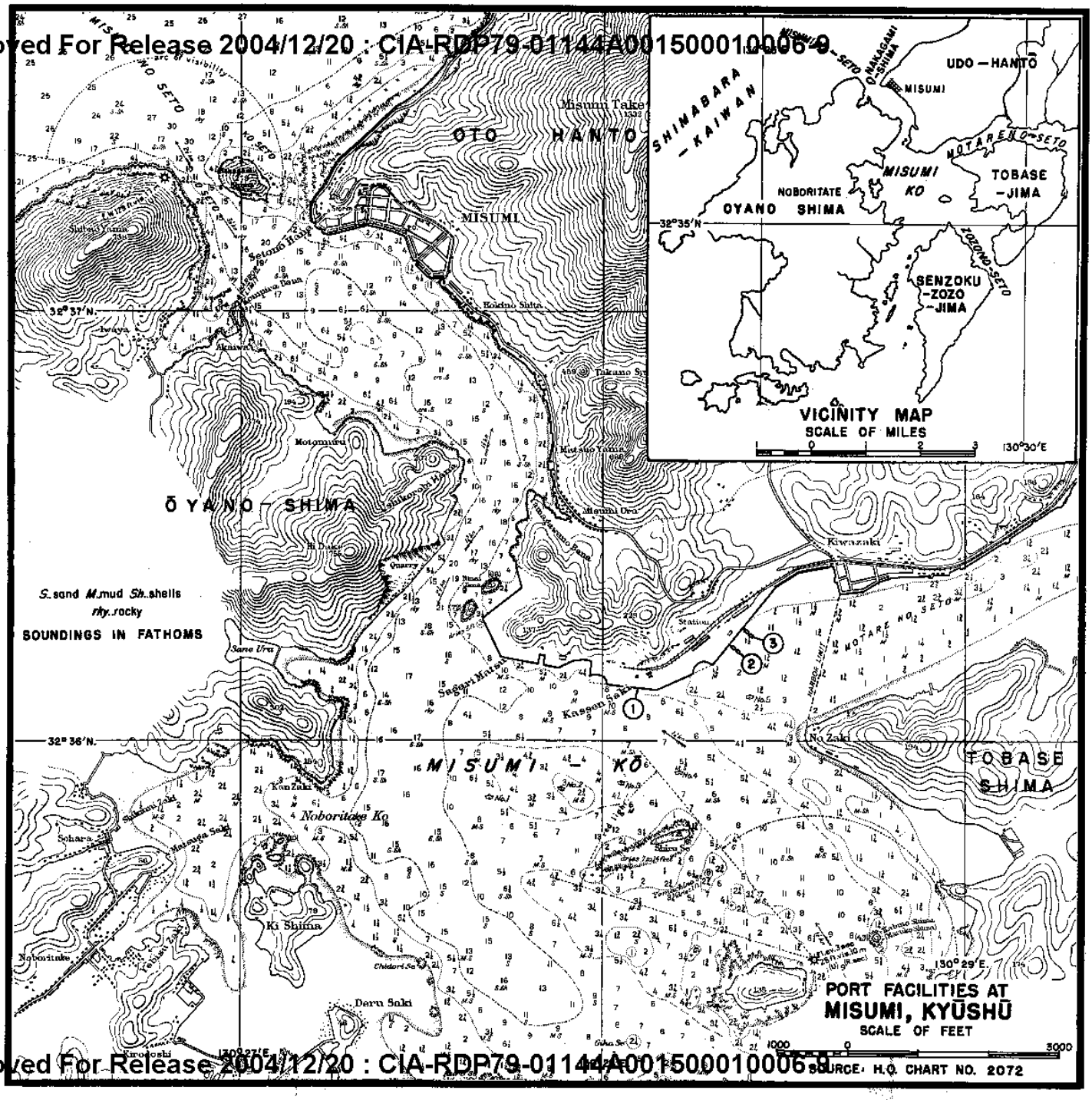


FIGURE VI - 29. *Misumi.*
Map of harbor showing location of port facilities by encircled reference numbers.

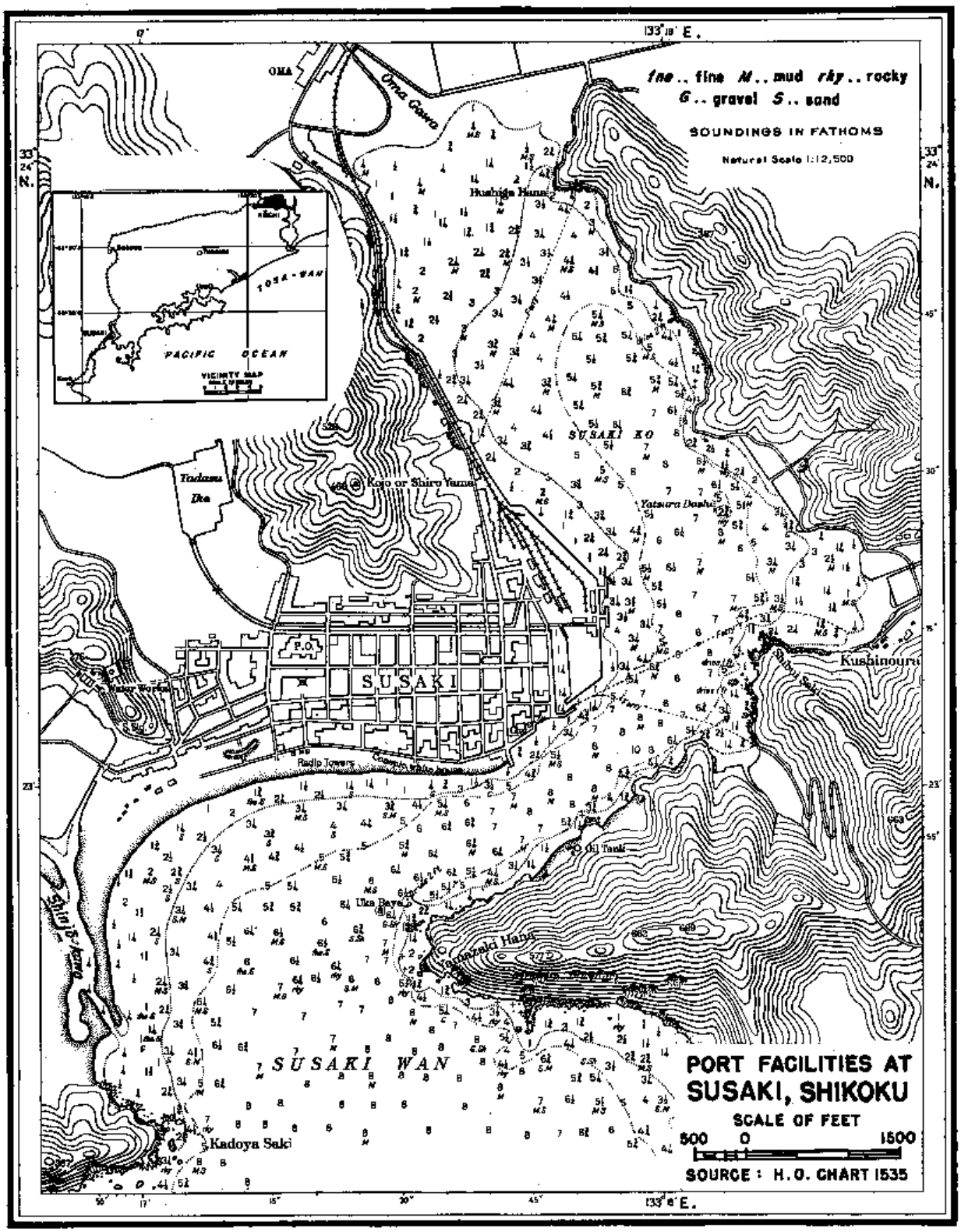


FIGURE VI - 44. *Susaki.*
Map of harbor showing location of port facilities.

(*c*) *Capacity and clearance.* The unloading capacity of the port is estimated to be 1000 short tons per day.

Highways and an electric railway lead to the town and the surrounding area (FIGURE VIII - 99)*. The rivers are probably navigable for small boats.

(*d*) *Supplies.* The Rising Sun Petroleum and Standard Vacuum Oil are represented in Kōchi, with adjacent storage compounds containing tank, drum, and case oil. Standard Vacuum has a warehouse for drum and case goods, a godown for gasoline and kerosene filling, and tanks having a total capacity of about 2,100 barrels. Rising Sun has 3 tanks with a combined capacity of 3,430 barrels of Diesel Oil.

Coal and water can be obtained.

(*e*) *Repair facilities.* Sangyo Shipyard in Urado-wan is probably engaged in minor repairs on the fishing fleet operating in the Kōchi area.

B. Secondary ports.

(1) Susaki (33° 23′ N, 133° 17′ E).

Susaki-ko, on a bay, Susaki-wan, is on the southern coast of Shikoku Island. Two wharves have depths of 19 feet alongside.

(*a*) *Harbor.* The harbor is ½ mile wide at its entrance, but narrows to about 300 yards at about ½ mile within, and again widens to 800 yards (FIGURE VI - 44). The depths in the central part of the harbor from the entrance to about 800 yards from the head are 5 to 8 fathoms. The deeper water is on the eastern side of the harbor.

Depths in the outer bay are from 10 to 18 fathoms and in Susaki-ko, 5 to 8 fathoms, except near the eastern and western shores and at the head of the bay.

The harbor, landlocked and surrounded by hills, affords complete shelter from northeasterly winds which occur only once or twice a year. Anchorage is available in 5½ to 6½ fathoms, over mud, at about 400 yards off the reclaimed land at the northeastern end of the town. Safe anchorage during any season can be taken in Nomi-wan, to the eastward of Susaki-wan.

The mean high water interval is 5 hours 55 minutes; the mean range is 3.2 feet; the spring range 4.6 feet. The annual temperature averages 65° F. with the rainfall about 100 inches. The temperature for Shikoku in summer is generally mild and clear.

(*b*) *Landing facilities.* A pier, about 150 feet long, with less than 6 feet of water alongside, is at the southeastern side of the town. At the eastern end of the town are 2 wharves, each about 280 feet long, with 19 feet of water alongside.

An artificial boat basin, about 800 by 150 feet is at the eastern waterfront of the town; the entrance has a depth of 1 fathom and is protected by a jetty (FIGURE VI - 45). Depths in this basin are from 1 to 1¼ fathoms. Photographs indicate the areas in front of the town and reclaimed land have been quayed. Depths vary from ¼ to 1½ fathoms.

(*c*) *Storage facilities.* Several large buildings are shown on the charts near the 2 eastern wharves. There are about 13 acres of open area at the waterfront; about 5 acres of this are served by railroad trackage.

*Town plan of Kochi, Chapter VIII.

(2) Komatsushima (34° 01′ N, 134° 35′ E).

Komatsushima is on the western side of Komatsushima-wan, on the east coast of Shikoku Island.

(*a*) *Harbor.* Komatsushima-ko is small, but is protected by 3 breakwaters; the middle one is detached (FIGURE VI - 46). The entrance to the harbor is between the north breakwater and the northern end of the detached breakwater. A part of the harbor has been dredged to 20 feet in depth. Depths in the remainder of the basin, and in the mouth of the river discharging into it, generally are 2¼ fathoms. The high water interval is 6 hours, 6 minutes. Springs rise 5¼ feet and neaps 4 feet.

(*b*) *Landing facilities.* A quay, approximately 1,125 feet long, with charted depths of 13 to 17 feet alongside, is on the northern side of the river entrance. It provides berthage for one 250-foot vessel drawing 16 feet, and three 200-foot vessels drawing 12 feet. A railroad serves the quay. Three floating piers are reported, but their locations cannot be determined from available data.

(*c*) *Capacity and clearance.* The unloading capacity of the port is estimated to be 1,000 short tons per day. Two railroads serve the town and port. Local steamer service is maintained and highways connect with towns in this vicinity.

(*d*) *Repair facilities.* There is a marine railway with a lifting capacity of 300 tons.

(3) Sumoto (34° 20′ N, 134° 54′ E).

Sumoto is on the eastern coast of Awaja Island, just off the northeastern coast of Shikoku.

(*a*) *Harbor.* Sumoto-kō is an artificial harbor protected by 2 breakwaters; the northwestern one is about 150 yards long; and the southeastern one is angular and about 175 yards long (FIGURE VI - 47). The entrance between the breakwaters is about 50 yards wide, with a charted controlling depth of 11¾ feet. The harbor comprises 2 basins: the northwestern one is about 365 yards long and 135 yards wide, with charted depths of 12½ to 18 feet; and the southeastern one is about 175 yards long and 70 yards wide, with charted depths of about 13 to 14 feet.

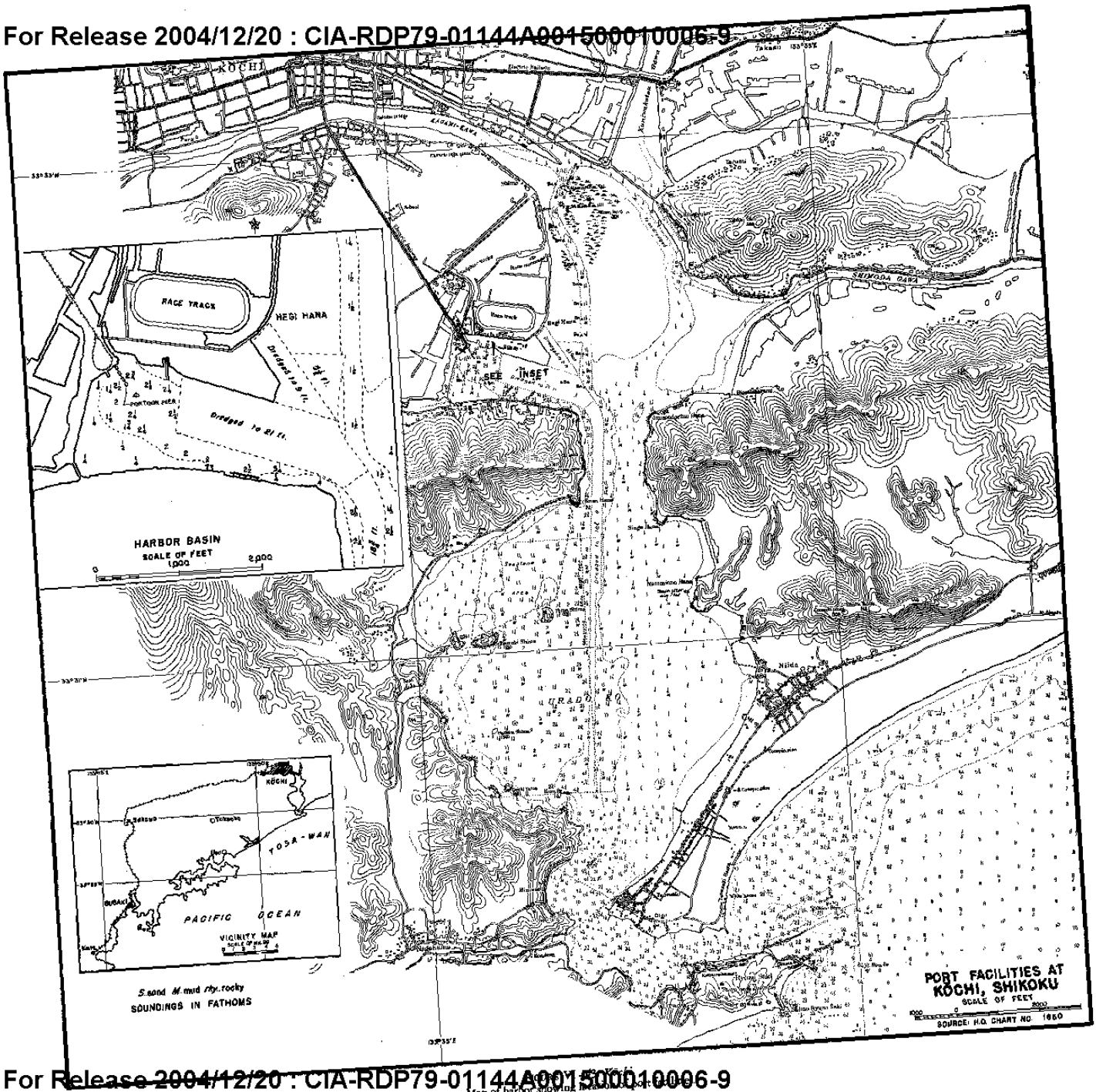
There are 2 structures, each about 115 feet long, which dry alongside during low water, outside the artificial harbor, southeastward of the southeastern breakwater.

The 10-fathom contour lies about 1,000 yards offshore at Sumoto and the 5-fathom contour about 425 yards.

The mean high water interval is 6 hours 52 minutes. Springs rise 4.9 feet, and neaps 3.9 feet.

(*b*) *Landing facilities.* There are 2 T-head and 6 small piers in the northwestern basin and another T-head pier in the southeastern basin. The T-head of the northeasternmost pier in the northwestern basin is about 60 feet long and 15 feet wide, with 14¾ feet charted alongside its face. The head of the other T-head pier in this basin is about 50 feet long and 15 feet wide, with depths of 15½ feet charted alongside its face. The 6 small piers project from the southeastern side of the basin into charted depths of 6¼ to 12¾ feet. The northwestern basin had about 130 feet of quays along the southwestern side with charted depths of 4 to 6½ feet alongside.

The T-head of the pier in the southeastern basin was about 45 feet long and 13 feet wide, with depths of 13 feet charted alongside its face. This basin had about 275 feet of quays along the



Map of harbor showing [illegible]

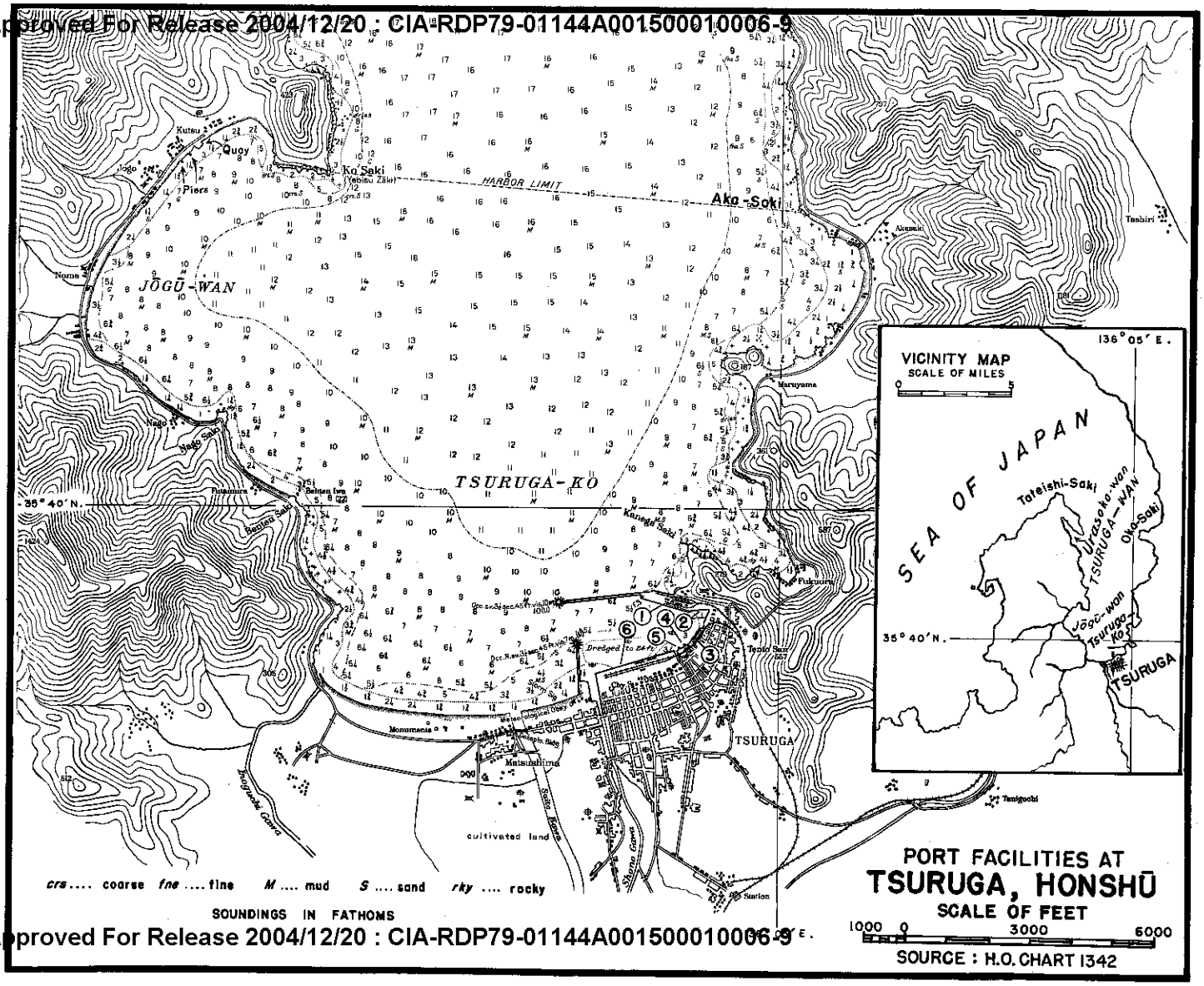


FIGURE VI - 66. *Tsuruga.*
Map of harbor showing location of port facilities by encircled reference numbers.

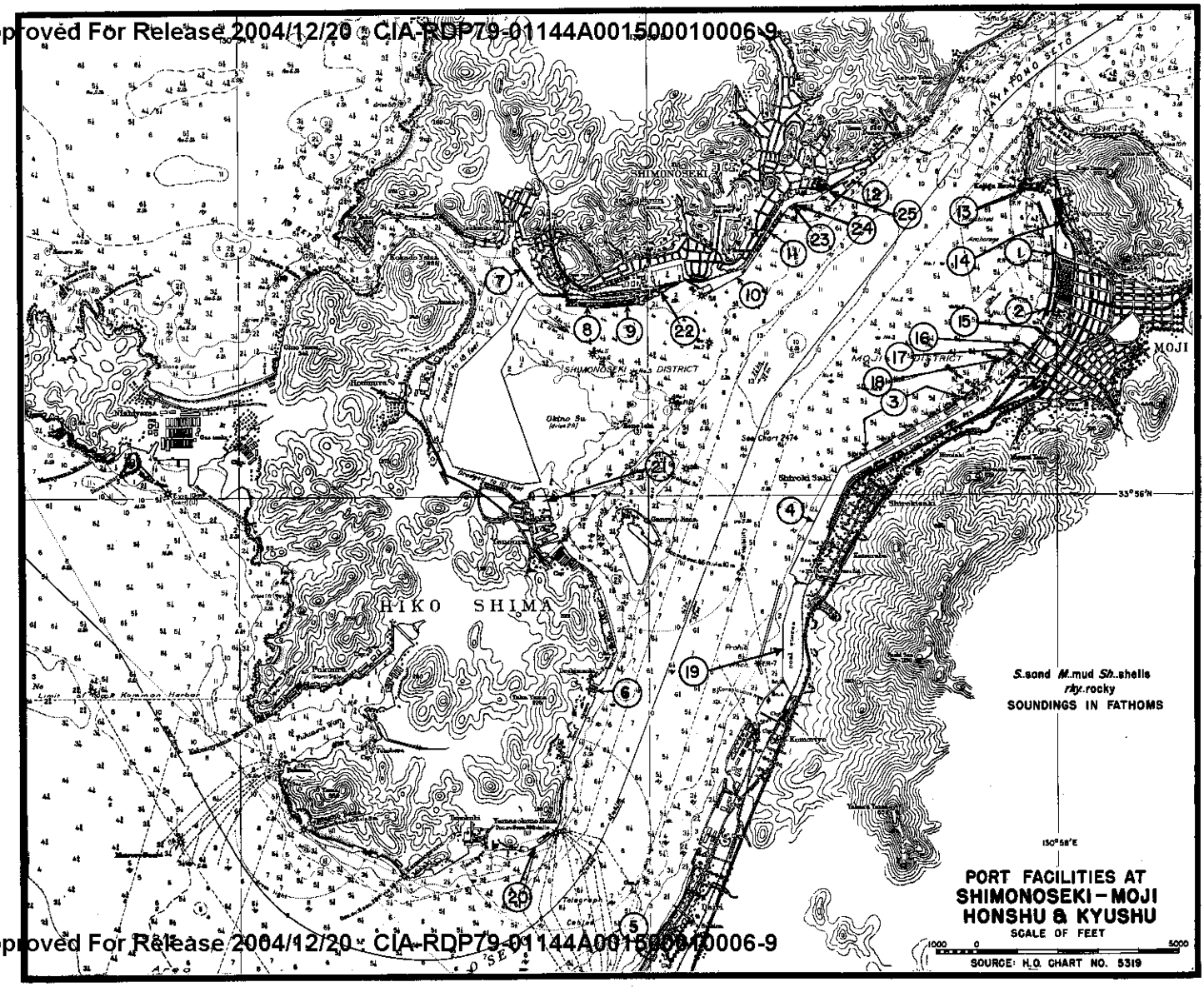


FIGURE VI - 73. *Shimonoseki-Moji.*
Map of harbor showing location of port facilities by encircled reference numbers.

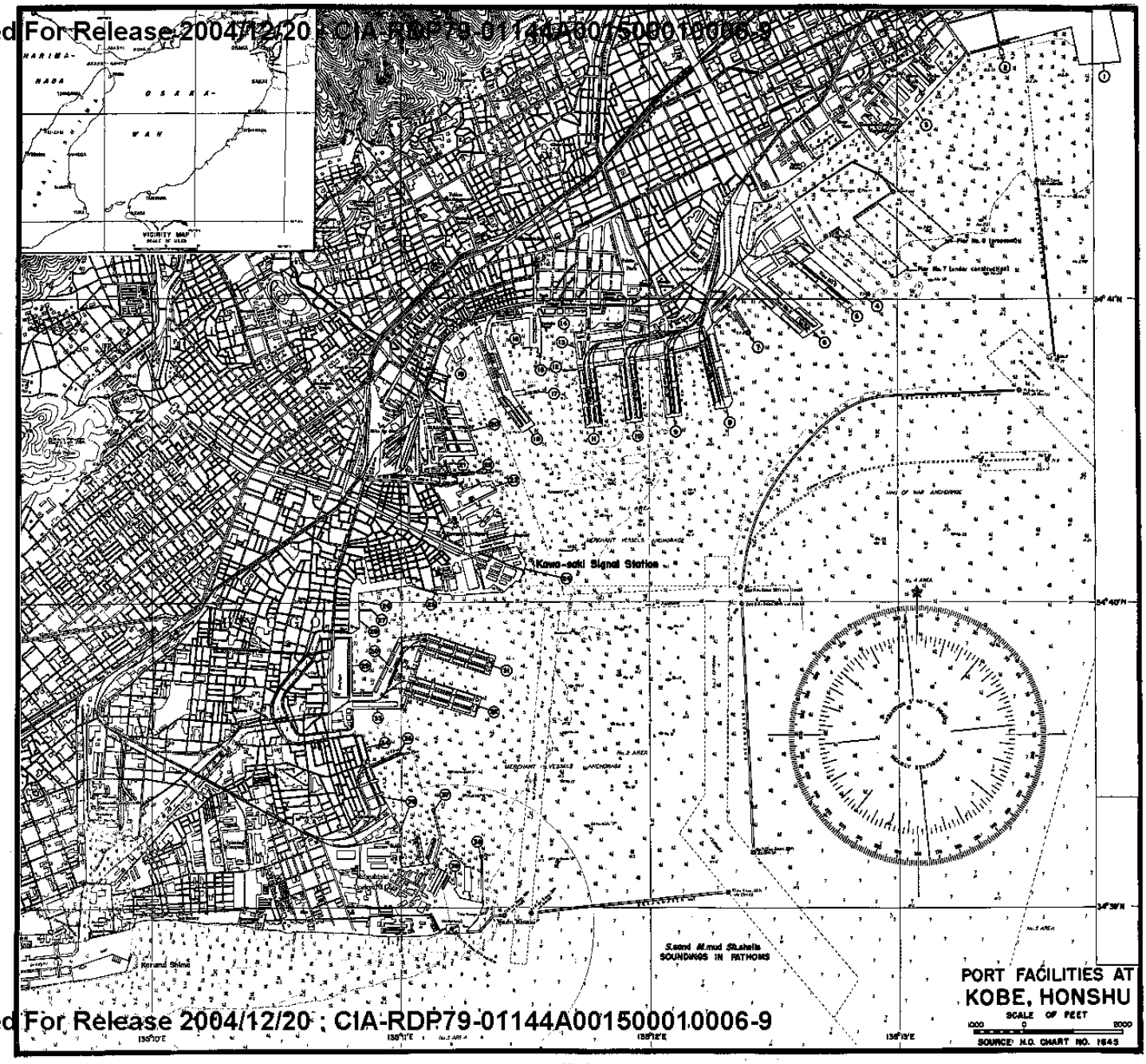


FIGURE VI - 82. *Kōbe.*
Map of harbor showing location of port facilities by encircled reference numbers.

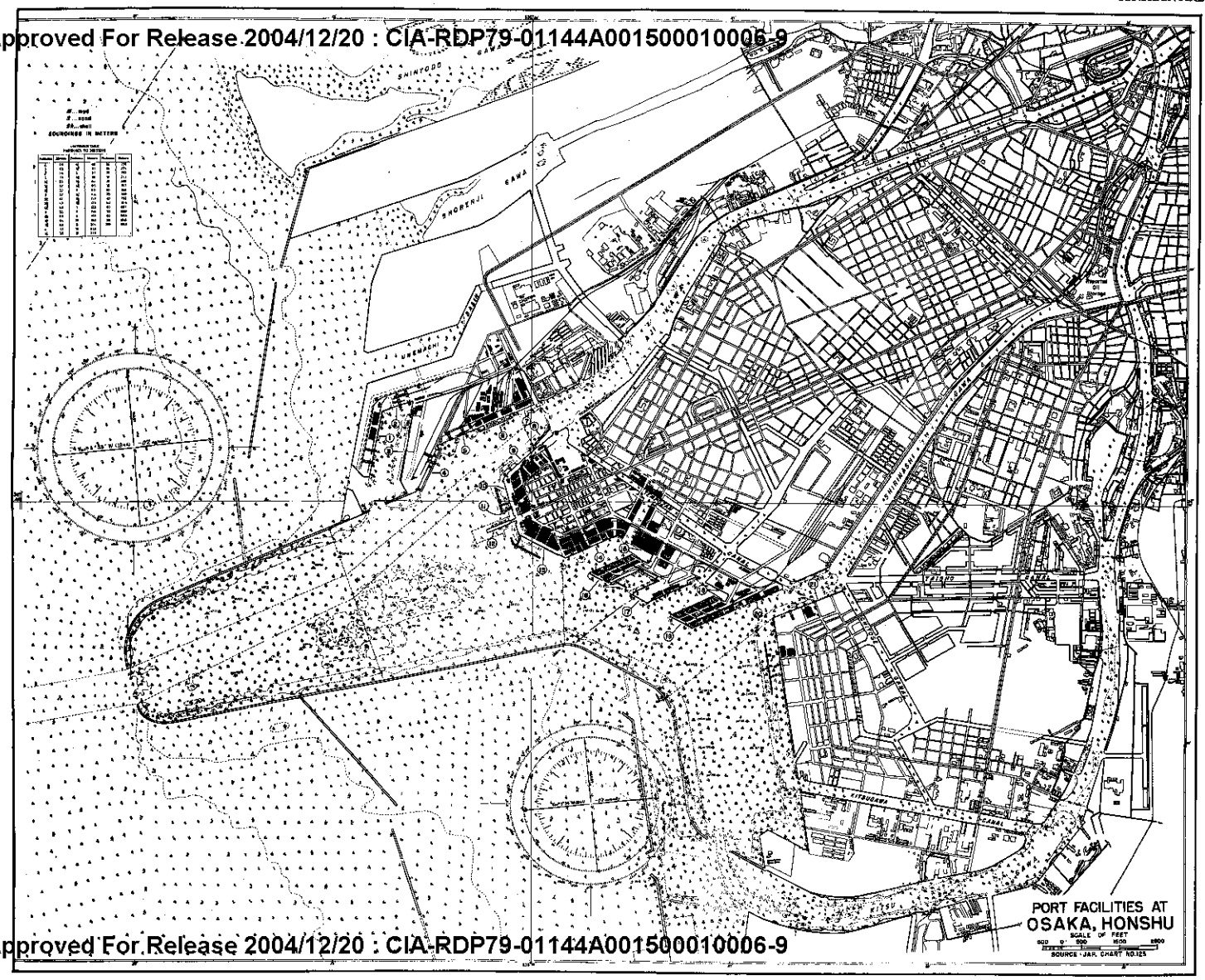


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FIGURE VI - 102. *Osaka.*
Map of harbor showing location of port facilities by encircled reference numbers.

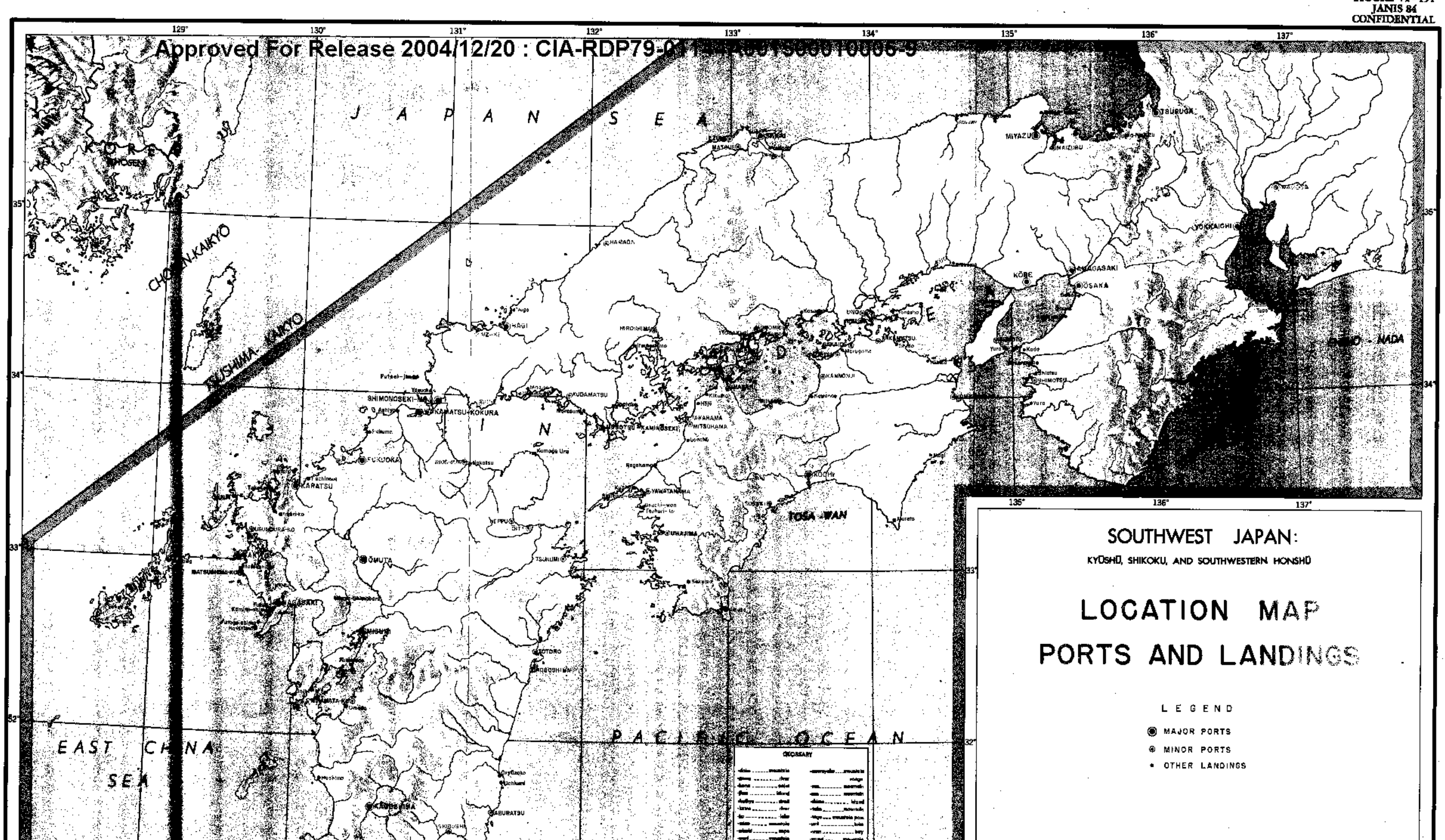

FIGURE VI - 154. *Southwest Japan.*
Map showing location of principal ports, secondary ports, and other landings on Kyūshū, Shikoku, and Southwest Honshū.